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ELECTRICAL WEST

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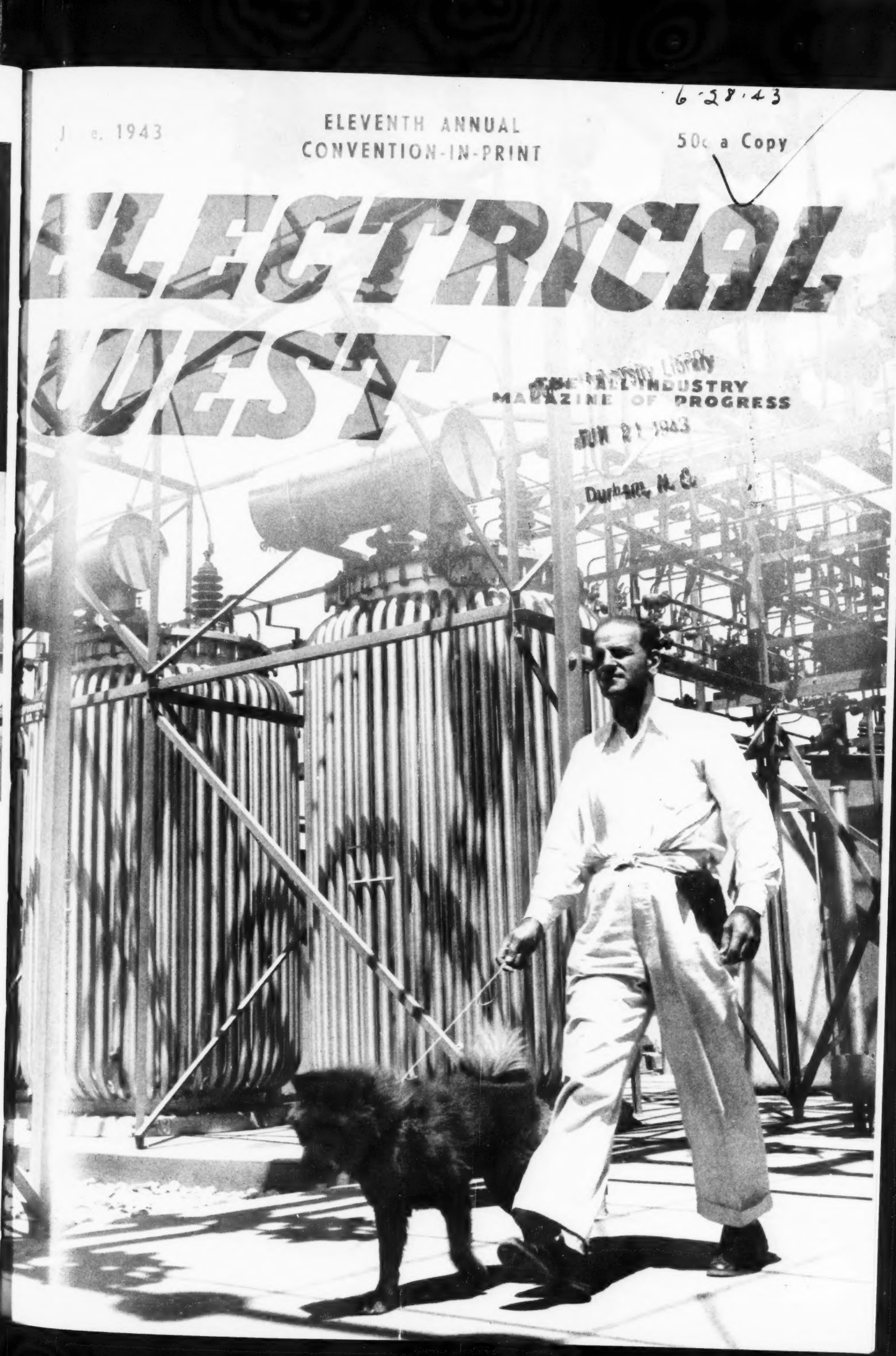
THE ELECTRICAL INDUSTRY
MAGAZINE OF PROGRESS



10,000,000 man-years of energy

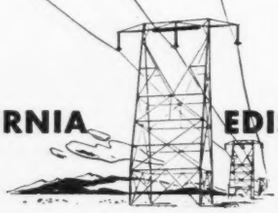
All Edison service in these wartimes is war service. In a total war in which everyone, fighter, war worker and civilian, is mobilized, all of the electricity we deliver helps out in the war effort.

Serving war production of all kinds, and including the many Southern California Army and Navy establishments, the Edison Company in 1942 furnished the equivalent in electric power of at least 10,000,000 man-years of energy.

This company takes pride in its war service. We are proud that despite the greatly increased service load, increased wages and other higher operating costs—and a large increase in taxes—there has been no increase in the cost of power to our consumers.

On the home front, domestic electricity is still one item in the family expenses which has not increased in cost. It has dropped in relative importance until it is only a fraction above one percent of the total average cost of living.

And there has been no rationing of electricity. In response to every call for electric service—from our regular customers, the new wartime producers or the armed services—we have responded promptly, "Present and ready for duty."



SOUTHERN CALIFORNIA EDISON COMPANY LTD.

643

WASTE IN WAR IS A CRIME . . . DO NOT WASTE ELECTRICITY JUST BECAUSE IT IS NOT RATIONED

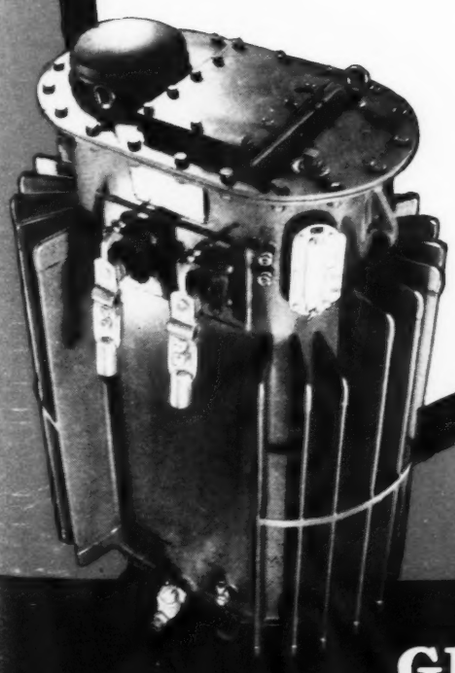
ELECTRICAL WEST (with which is consolidated The Journal of Electricity), June, 1943. Vol. 90, No. 6. Published monthly by the McGraw-Hill Company of California, 68 Post Street, San Francisco, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, and Canada, $2 per year; all other countries $3 gold (thirteen shillings). Single copy 25c.

Copyright, 1943. McGraw-Hill Company of California.

Simplify transformer installations with all-purpose Pyranol transformers

From the one fact that Pyranol* won't burn spring many benefits that would otherwise be difficult to obtain. Since you don't need expensive, fireproof vaults, you can install Pyranol transformers anywhere you wish—in the basement, on overhead beams, on the roof, or on the factory floor *at the center of the load*. Load-center distribution is highly desirable today because of the great savings in secondary copper that it makes possible. (Also, power losses are less and voltage regulation is +o per cent better in the usual case.)

And whether the location you choose is indoors or outdoors, above ground or underground, wet or dry, clean or dusty, these *all-purpose transformers* will supply the power for your war loads with little or no maintenance.



***Pyranol** is the G-E trade name for askarel, a noninflammable, nonsludging insulating liquid. Ask your G-E representative for Bulletin GES-2974—the complete story for a safer plant. *General Electric, Schenectady, N. Y.*

GENERAL ELECTRIC

Here in the WEST

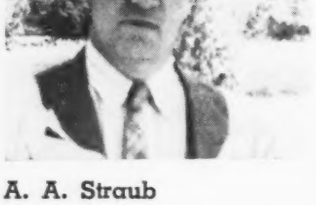
People

Howard Miller

whose paper on reducing wartime accident hazards is published on p. 91 has been in the electrical business for 36 years. And except for time out during World War I (he served four years in the submarine service), he has been with Southern California Edison Co. since 1912, acting as safety supervisor for the past 16 years.

Colonel George A. Hunt

author of the article on utility plant protection (p. 83) is personal assistant to Paul M. Downing, vice-president and general manager of Pacific Gas and Electric Co. For three years following graduation from the University of California, he was with the J. G. White Engineering Corp., serving successively as office engineer, assistant hydraulic engineer and field construction engineer. From 1914 to 1917 he was field construction engineer for Sierra and San Francisco Power Co., leaving to go with the U. S. Army Engineers. He was in the Army three years, two of them in France, Belgium and Germany, and was advanced from the rank of captain to lieutenant-colonel. In 1920 he took his present post with the utility, but he continued his military interest. From 1923 to 1941, as colonel, CWS, he organized and trained the 302nd Chemical regiment. He trained some 150 officers now on active duty.



A. A. Straub

who writes about personnel training in wartime (p. 95) is a division engineer in Southern California Edison Co.'s substation department. Before he joined the company in 1923, he had worked as oil stove repair man, truck driver, superintendent, draftsman and timekeeper. Starting with Edison as meter tester, he was made test electrician in 1931 and division engineer in 1942.

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Cooperation in the Pacific Northwest 69
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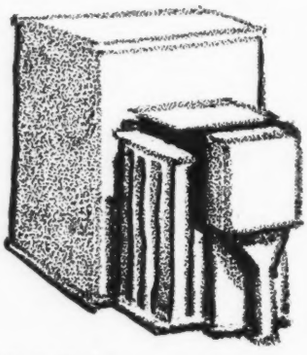
Cover photo: Harry Meader, guard at one of Los Angeles Bureau of Power & Light's distributing stations, makes the rounds with a canine helper. Photo by Julian Robinson.

Preview



Transformers

Large amounts of critical materials can be saved by using a single 3-phase power transformer in place of three or four single-phase power units. A well-informed author will discuss this development and the application of equipment. He will also cover the economics involved.

Unit Subs

make a means for subdividing large and widespread industrial power loads for maximum operating efficiency and reduced copper in distribution. A paper on the subject presented the maintenance engineers in southern California will be repeated in print for all who weren't there to hear and for those who heard but want the details, next issue. Either the Kaiser steel plant at Fontana or an important paper on war substitute wire insulations, depending on releases, will accompany.

Home Study

helps to make electricians at Moore shipyards. The story of this unique supplemental training will appear next month.

PCEA—NWELPA

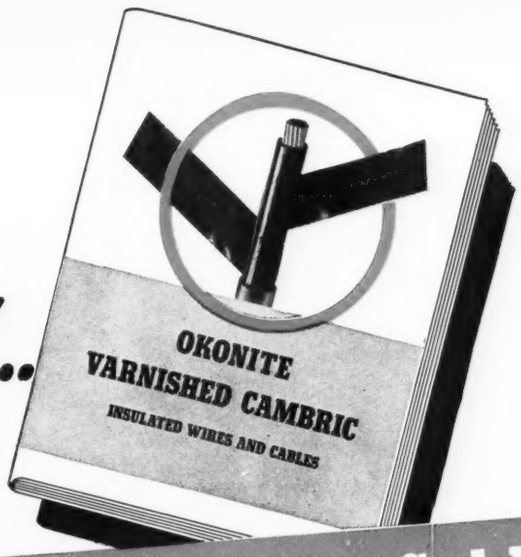
Vital and brief war conferences of these two associations will be held in June and reported in full in July's number.

Blasted Dams

Picture feature will be before and after aerial views of the recently bombed German dams.

THIS BULLETIN...

Is the Most Comprehensive Ever Published on



Varnished Cambric Insulated Cables

Varnished cambric insulated wires and cables are ideally suited for numerous electrical applications.

The valuable information contained in this Bulletin should be in the hands of every man who has a part in installing, maintaining or buying insulated wires and cables for every electrical operation. It will tell him how varnished cabric insulated wires and cables will adequately and safely fill his requirements, and at the same time save critical war materials. A bound-in supplement gives consideration for increased loading under wartime conditions.

Bulletin OK-1013, just off the press, is the most comprehensive ever published on varnished cambric insulated wires and cables and shows in detail: Specification and test data – Underwriters' (N.E.C.) approvals – Shielding – Application range – Selector Chart – Protective coverings – Conductor designs – Construction data – Current-carrying capacities, 1 – in underground ducts, 2 – in conduit, 3 – in air, 4 – buried in earth.

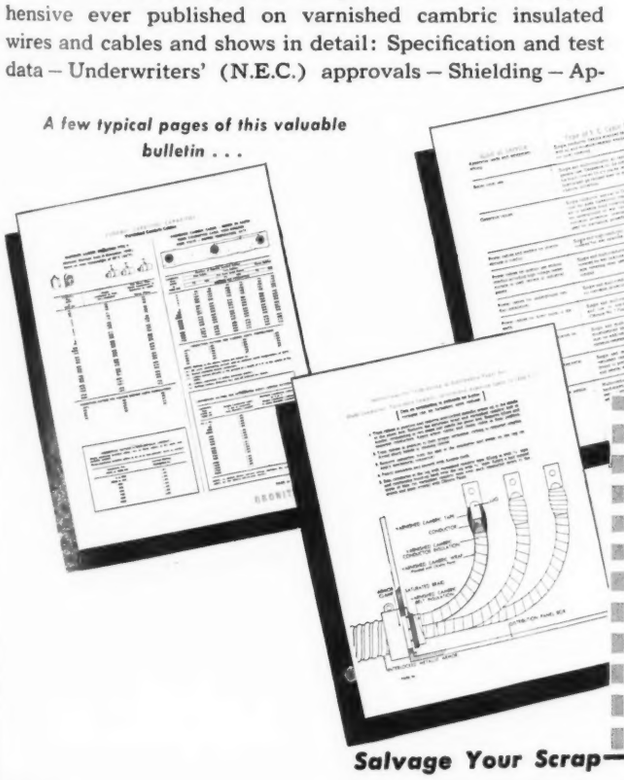
Correction factors for segmental conductors, non-metallic conduit and d.c. ratings – Voltage drop tables – Conduit capacities – Splicing instructions – Terminating without pot-heads – Essential purchase data, etc.

To get your FREE copy of this valuable Bulletin, fill out and mail the attached coupon *now*.

THE OKONITE COMPANY

Executive Offices: Passaic, N. J. ***Offices in Principal Cities***

A few typical pages of this valuable bulletin . . .



3271

Date ....., 1943

THE OKONITE COMPANY
Passaic, New Jersey

Gentlemen:

You bet I'd like a free copy of your Bulletin OK-1013. Send it to:

Name .....

Title .....

Company .....

Address .....

Salvage Your Scrap—Buy U. S. War Bonds

"SEE-ABILITY"

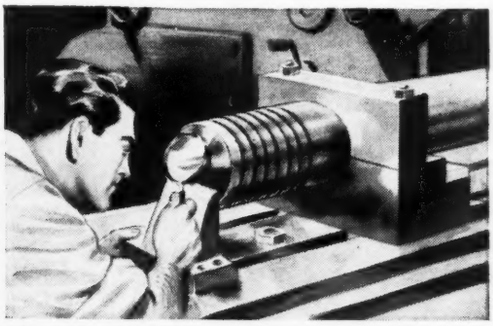
BORE TELESCOPE with strong interior light provides "SEE-ABILITY", permitting inspector to examine inside of gun tube.

NOT ONLY MORE GUNS, but better guns, are coming out of the arsenals of democracy. Better workmanship, greater accuracy are possible because of better "See-ability" over the lathes, boring machines, drills, and inspection benches.

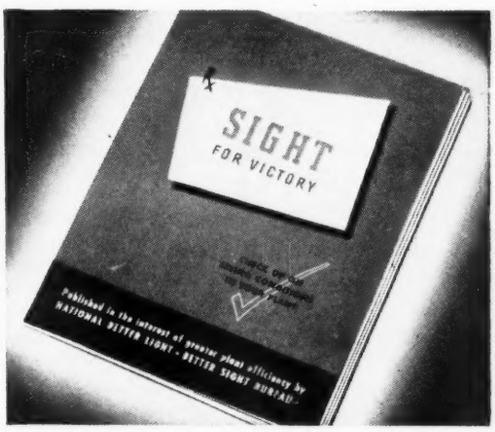
Through its knowledge of modern lighting, Westinghouse is contributing daily to improved "See-ability" in our war plants. Knowing that the heart of good lighting is the lamp, Westinghouse has steadily improved quality. Today Westinghouse fluorescent lamps are brighter than ever, and they stay bright from end to end.

builds better guns

IN MODERN GUNS accuracy is checked at every step in manufacture. "SEE-ABILITY" aids these close inspections.



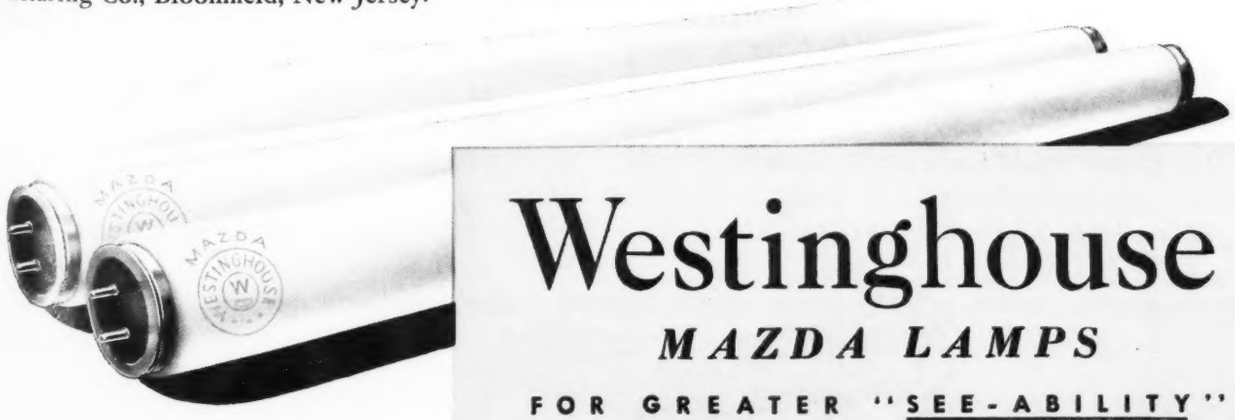
ACCURACY IN testing, grinding, machining, assembling, and hundreds of other operations depend on "SEE-ABILITY."



JUST OFF THE PRESS! 32 page book, "SIGHT FOR VICTORY," prepared by National Better Light—Better Sight Bureau. Designed to be presented by lighting men to every war plant in America. Includes valuable check forms for comprehensive "SEE-ABILITY" analyses. Every lighting man should be familiar with this book.

Join the "Sight for Victory" Program

The National Better Light-Better Sight Bureau has pointed up the wartime objectives of the lighting industry, starting with a check-up of seeing conditions in war production factories. We can all help in this important task and make the check-up complete by July 4, 1943. "See-ability" is a must for good workmanship, accuracy, and increased production. Let's all do our part in the "Sight for Victory" program, help win the war faster, and then we can all have the opportunity we have been waiting for. Westinghouse Electric and Manufacturing Co., Bloomfield, New Jersey.



Westinghouse

MAZDA LAMPS

FOR GREATER "SEE-ABILITY"

File....but

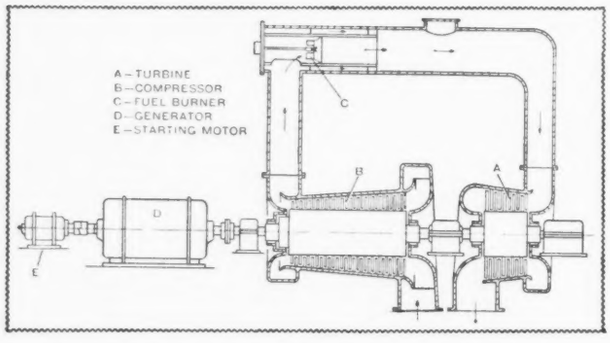
NEW IDEAS IN POWER AND ELECTRICAL EQUIPMENT ARE TAKING

AVAILABLE UNDER HIGH PRIORITIES....ALL BELONG IN THE

☛ Power plant of the future probably will be built around gas turbines... operating at efficiencies equal to or better than diesels but with the low maintenance and simple lubrication of steam turbines. Building space per unit output will be lowest of any prime mover and no water will be required.

Present signs: already 19 Allis-Chalmers gas turbines and compressor units are employed in refining high-octane gasoline.

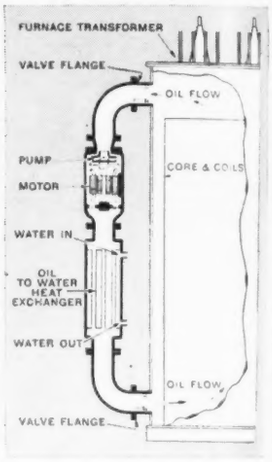
Operating sequence: 1) starting motor slowly rotates unit, building up air pressure, 2) fuel burner is ignited and hot gas enters turbine, 3) turbine takes load, drives compressor and generator, starting motor is disconnected.



OPERATING DIAGRAM OF MODERN COMBUSTION TURBINE

☛ Just moving oil faster in special transformer radiators — cools it enough so that designers need less copper and steel in transformer cores and coils. Allis-Chalmers "Electro-Cooler" does just that—but what's more it's done so simply that it makes forced oil cooling practical. That's the magic word—PRACTICAL!

So now that water-cooling coils are banned by WPB—and electric furnace transformers must be built without them—the "Electro-Cooler" with an oil-to-water heat exchanger replaces them. Allis-Chalmers transformer engineers save copper tubing—give steel makers a substitute for the water-cooled furnace transformer.



OIL-TO-WATER "ELECTRO-COOLER"

Investigate the widening applications of the "Electro-Cooler"—a unit composed of a heat exchanger and a "pump-in-a-pipe." Motor and pump are both immersed and lubricated by cooling oil.

☛ In the heart of a mercury arc rectifier, power-carrying electrons await the moment when a flash of bluish lightning will carry them from the anode to the cathode. There's one anode in each tank of a 6-tank Allis-Chalmers "Excitron" rectifier. Every 360th of a second, in sequence, bluish arcs flash in these tanks. What is the wizardry that times these arcs?

Excitrons are built to "fire when ready"—a procedure made possible by continuous excitation!

At the precise moment that a-c voltage on the anode equals the internal resistance of the mercury vapor gap—the bluish arc "train" leaves for the cathode.

A-C ALLIS-CHALMERS MILWAUKEE WE WORK FOR VICTORY WE PLAN FOR PEACE

ALLIS

don't forget

SHAPE FAST AT ALLIS-CHALMERS TODAY. SOME ARE ALREADY BACK OF EVERY LONG-RANGE PLANNER'S HEAD. HERE ARE A FEW:

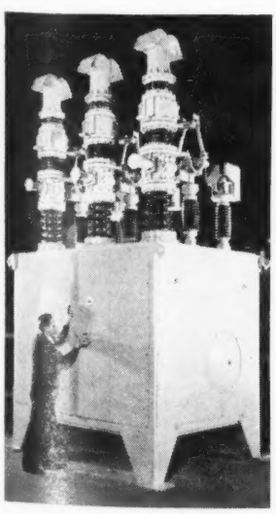
Six pilot arcs burning steadily do the trick—they're always ready to start the "trains" on the 360th of the second. Herein lies the simplicity and stability of the Allis-Chalmers "Excitron."

High priority wall surrounds "Excitron" today, prevents all but most essential uses.

But plan to use it postwar. Higher efficiency of "Excitron" suggests profitable replacement of thousands of motor generator sets and synchronous converters.

☛ Keep your eye on stronger trend toward air blast circuit breakers. Past year has seen Allis-Chalmers air-blast installations more than doubled.

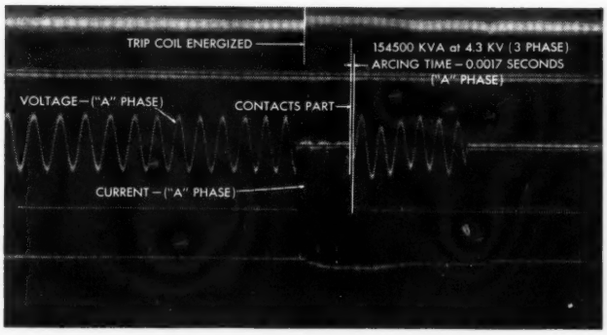
Think of air-blast breakers in terms of protection and maintenance savings. Arcing times, less than 1/2 cycle throughout operating range, mean amazing contact life.



1,000,000 KVA AIR BLAST

Here's how it works in brief: small contact piston pulls back from orifice, high pressure dry air rushing into hole. Arc rushes through, too . . . stretches out and vanishes—at split-cycle speed.

Reliability? Air brake systems of heavy trains are no safer.



OSCILLOGRAM OF AIR BLAST INTERRUPTION

☛ Biggest graphite "pencils" in the world write the flaming story of armor in the electric arc furnaces of Uncle Sam. Formerly these pencil-like electrodes were misguided by erratic up and down movements—calculated to keep pace with the melting charge. But at 3000 deg. F—overtravel and under-travel just burned them up and caused inefficient melting.

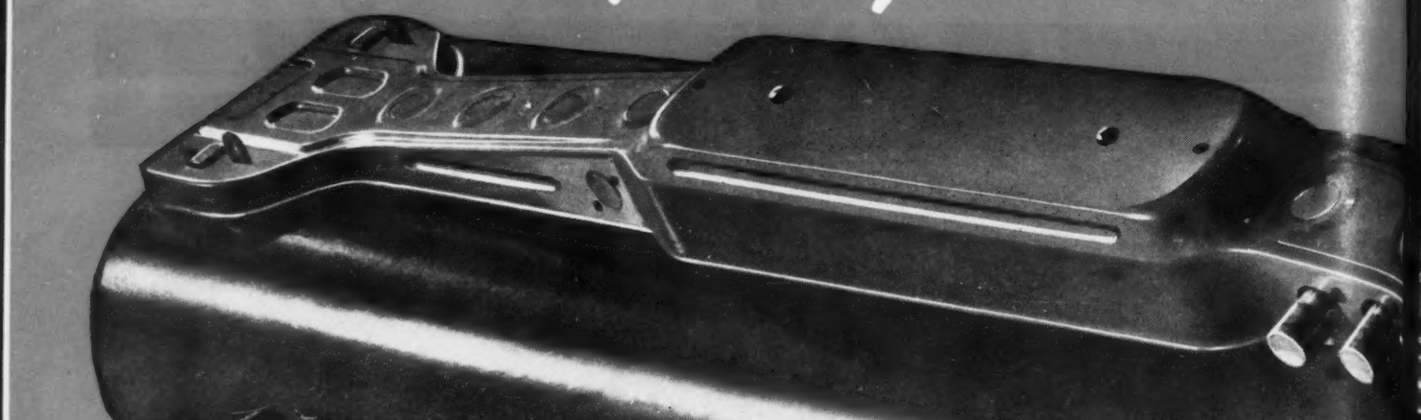
With a new sensitive, wide-range control generator called the "Regulex" exciter — Allis-Chalmers engineers are keeping furnace arcs constant, enabling extra "heats" per day, conserving graphite electrodes. Steel men are happy now!

Basic fact is that amplifying characteristics of "Regulex" exciter parallel in many respects those of the electronic tube—with the important exception that it has d-c machine life and ruggedness.

Look for other important new developments in electrical and power equipment from Allis-Chalmers. Maybe we can help you — maybe you can help us. ALLIS-CHALMERS, MILWAUKEE, WIS. A1612

CHALMERS

SYLVANIA *proudly announces*



MORE LIGHT FROM LESS WEIGHT

Sylvania pioneered composition reflectors for fluorescent fixtures and "proved them in industry."

This composition reflector has an efficiency of 86 per cent—even higher than that of prewar porcelain-enameled metal in conventional contours.

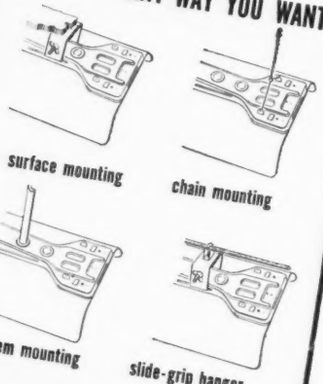
It is fabricated to Sylvania's specifications from a strong and durable composition. Coated with MIRACOAT inside and a handsome French Gray outside, it stands up under extreme humidity and temperature conditions. Also it is impervious to frequent washings.

It gives more light. It's lighter and easier to handle.

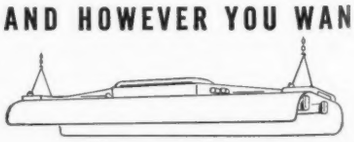
EXCLUSIVE "CAPTIVE LATCH"

This Sylvania-developed spring-type fastener saves installation and maintenance man-hours. It stays put while lamp is in service despite any kind of vibration. It locks or unlocks with a simple quarter turn. No tools are necessary.

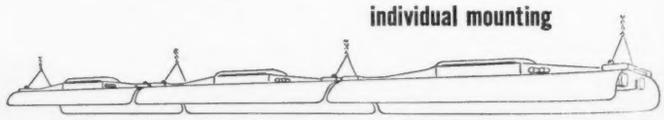
HANG IT ANY WAY YOU WANT



AND HOWEVER YOU WANT



individual mounting



continuous row installation

THE FLUORESCENT FIXTURE OF THE FUTURE!

- EASIER INSTALLATION
- SPEEDIER MAINTENANCE
- SINGLE OR CONTINUOUS ROW INSTALLATION
- SIMPLE
- STANDARD
- REGULAR SIZE USES 2 OR 3 40-WATT LAMPS
- LARGE SIZE USES 2 100-WATT LAMPS

This adds up to a modern, standard, adaptable fluorescent fixture that eliminates installation headaches and stock troubles.

HERE'S what you've been hoping for—years ahead of time—a fluorescent fixture that has "everything"—the fixture of the future NOW.

Once again Sylvania engineers have taken another long step forward, and designed a unique industrial fixture without metallic reflector, with top-housing under three pounds. Their perfected design is a revelation of simplicity and adaptability.

This new Sylvania fixture is made in two sizes—for 100-watt and 40-watt lamps. In either length, *one* standard fixture will fill any industrial lighting requirement.

. . . Can be installed singly or in continuous rows.

. . . Can be stem-mounted, surface-mounted, mounted with chains or slide-grip hangers.

. . . Can take either two or three lamps.

This one-for-all-purpose adaptability is attained by the streamlined top-housing that encloses the ballast, protects it and provides cooler performance. One-half-inch center knock-outs at centers of 18, 24, 30 and 36 inches provide for any type of mounting. The starter sockets are readily accessible, and there is a convenient knock-out for a pull-chain switch if desired.

This is the fluorescent fixture of the future that the trade has been waiting for. It meets all WPB requirements, carries Underwriters' Laboratories approval and our own standard guarantee. For specifications and prices, write Dept. X-00, Sylvania, Ipswich, Mass.

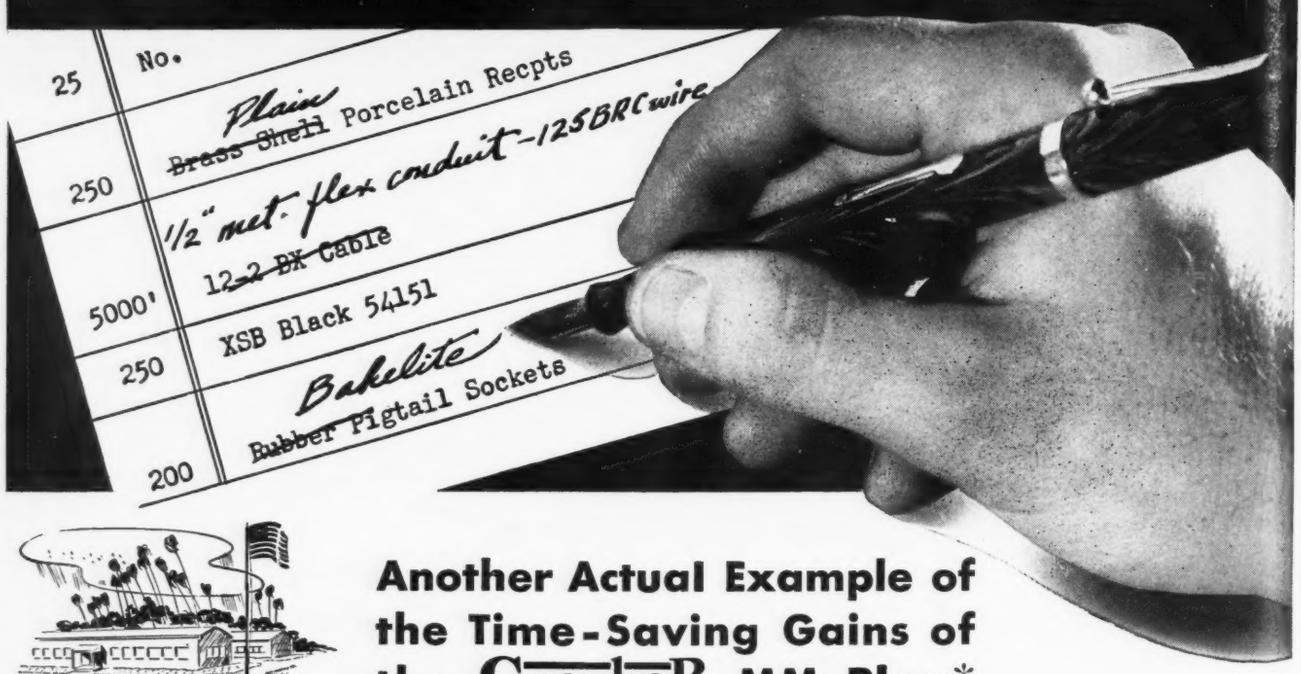
"Everything that's Finest in Fluorescent"

SYLVANIA ELECTRIC PRODUCTS INC.

Fluorescent Fixture Division, Ipswich, Mass.

INCANDESCENT LAMPS, FLUORESCENT LAMPS, FIXTURES AND ACCESSORIES, RADIO TUBES, ELECTRONIC DEVICES

BY FILLING-IN "Between the Lines" THE ORDER WENT OUT COMPLETE



Another Actual Example of the Time-Saving Gains of the GraybaR MM Plan*

A CONTRACTOR faced with the job of pushing 150 miles of Central American highway through the jungle had to begin with barracks construction and other basic facilities calling for a wide range of electrical supplies. The sailing date for supply ship from a West Coast port had been set for 8 days hence.

THE BILL OF MATERIALS that was rushed to GRAYBAR showed many items that could only be obtained from the East, and then on 8 to 10 weeks delivery. But GRAYBAR looked at the list realistically. In almost every case, "pinch-hitters" which could be substituted for the missing items were available from GRAYBAR's local warehouses or local sources of supply.

GRAYBAR SPECIALISTS sat down with the contractor's engineers and checked through the list item by item. Porcelain outlet boxes replaced steel, Bakelite pigtail sockets replaced rubber, and so on down the line. Years of experience on wiring supplies, plus up-to-the-minute delivery facts, enabled GRAYBAR to build a *complete* list for the job that could be shipped on time.

BY FILLING-IN between the lines, the entire shipment was on board at sailing time. The barracks were satisfactorily wired and equipped.

*Serving as your MATERIALS MOBILIZER

By this GRAYBAR service, your electrical needs are linked to the available output of 200 manufacturers, mobilized locally at more than 80 warehouses. The MM Plan "dovetails" GRAYBAR's procurement work with your own purchasing requirements. You save time in getting estimates, checking specifications, expediting delivery, locating "hard-to-get" items. Ask your local GRAYBAR Representative how this "one-call" service can help you.

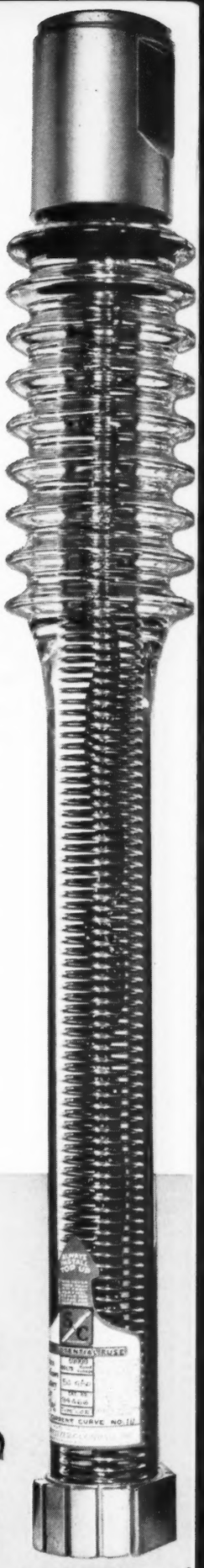
Executive Offices: GRAYBAR BUILDING New York, N. Y.

GraybaR

IN OVER 80 PRINCIPAL CITIES

GraybaR Everything Electrical . . . . THAT IT TAKES TO WIN!

PROVEN PROTECTIVE EQUIPMENT IS MORE NECESSARY TODAY



● With continuous power supply now a vital necessity to increased and maintained war material production—the importance of dependable, time-proven protective equipment has never been greater. Power supply *must not* fail.

During a quarter of a century S & C Fuses and other protective equipment have been chosen by leading electrical engineers. The traditional S & C thoroughness, careful engineering and research, precision manufacturing, and long experience in this specialized field, all guarantee the effectiveness of fuse protective equipment bearing the S & C trademark.

Realizing the seriousness of war production demands, S & C engineers have analyzed requirements, and manufacturing schedules have been stepped up. Today, reliable High Capacity Fuses are being more widely applied because of war conditions,—they will provide adequate power system protection and can be obtained quickly. To save time, S & C field sales representatives are ready to assist you in the selection of the type of fusing equipment suited to your needs.

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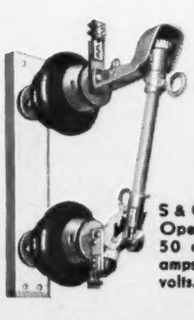
SCHWEITZER & CONRAD, INC., 4435 Ravenswood Ave., Chicago, Ill.
Manufactured in Canada by Powerlite Devices, Ltd., Toronto, Ont.
EXPERIENCE WILL CHOOSE THE S & C FUSE

FUSING EQUIPMENT

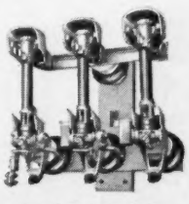
S & C Type "SM" high interrupting capacity Fuses for severe short-circuit conditions. Has field-replaceable fuse unit. 7,500 to 34,500 volts, 1 to 400 amp.



S & C Semafor Open Cutout. 50 and 100 amps., 46,000 volts.

S & C Semafor Box Type Cutout. 50 and 100 amps., 5,000 and 7,500/12,500 Y volts.

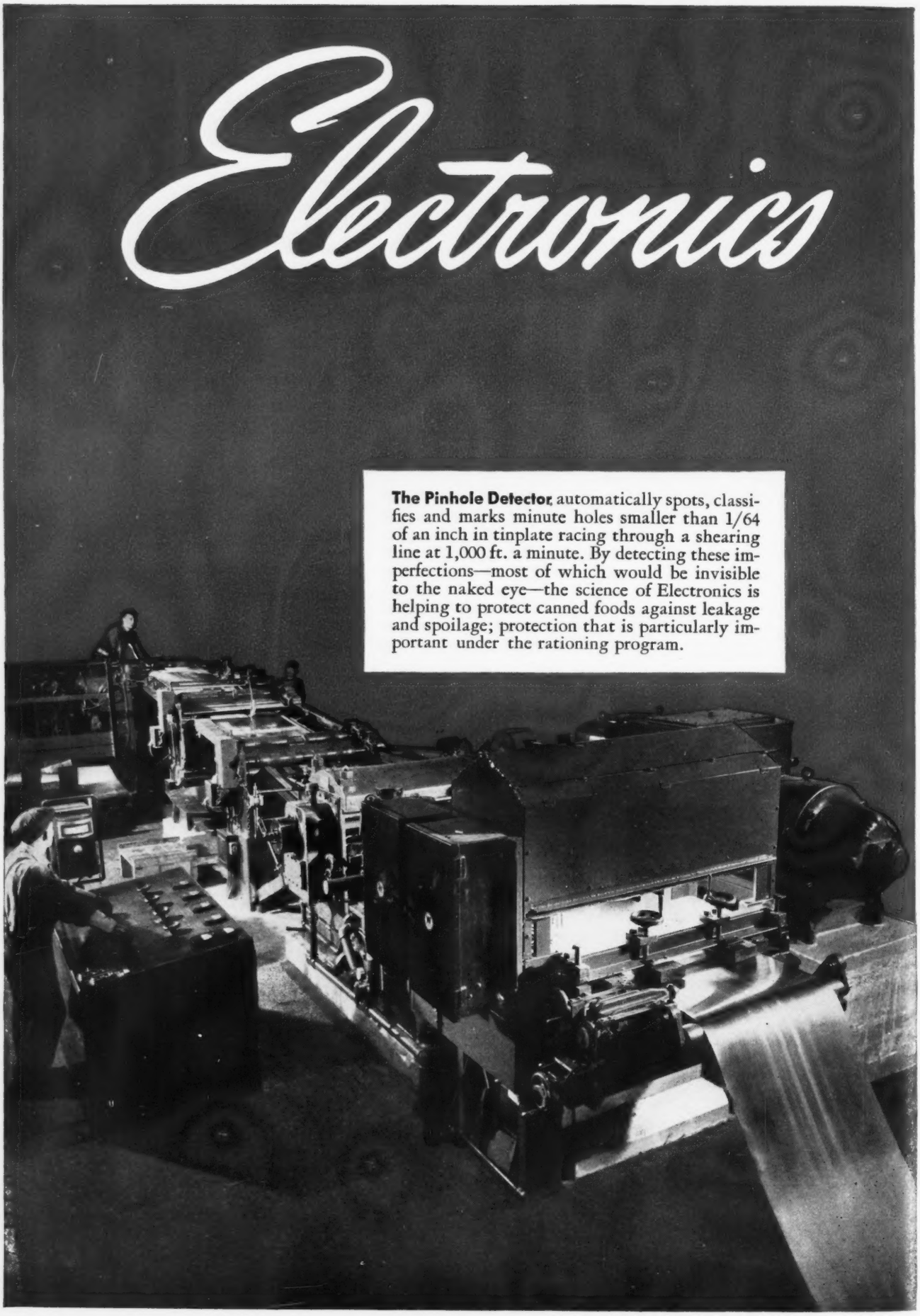
S & C Universal Silver Fuse Links for all makes of Distribution Cutouts.



S & C Automatic Reclosing Fuses in capacities and types for use on system voltages from 2,300 to 46,000.

S & C type COR Liquid Fuse to 400 amps., 66,000 to 138,000 volts. The SMG Fuse is similar but has replaceable solid material fuse element (46,000 to 138,000 volts).

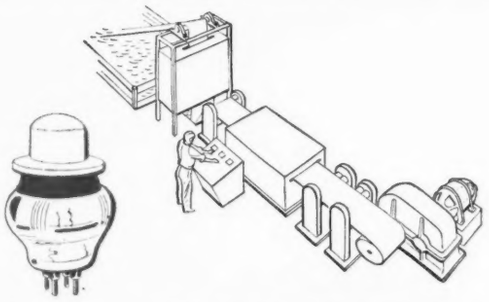
Electronics



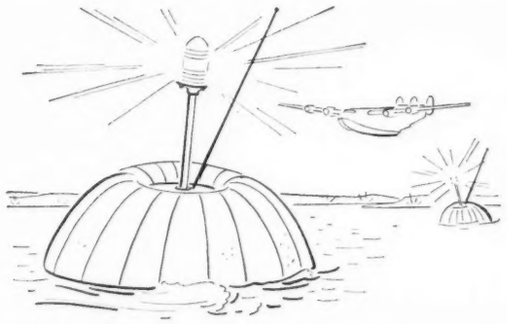
The Pinhole Detector automatically spots, classifies and marks minute holes smaller than 1/64 of an inch in tinplate racing through a shearing line at 1,000 ft. a minute. By detecting these imperfections—most of which would be invisible to the naked eye—the science of Electronics is helping to protect canned foods against leakage and spoilage; protection that is particularly important under the rationing program.

. . . at Work

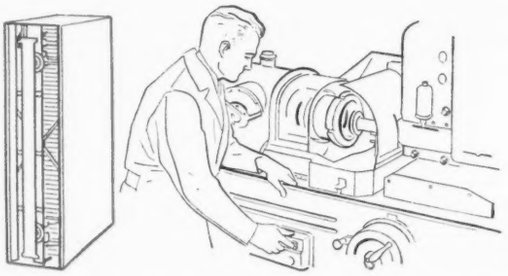
Exciting as the future of Electronics may be, it is far more than a "science of tomorrow." Electronic devices are at work *today* in practically every war industry—speeding production, improving products, cutting costs. Here are typical examples of Westinghouse "Electronics at Work."



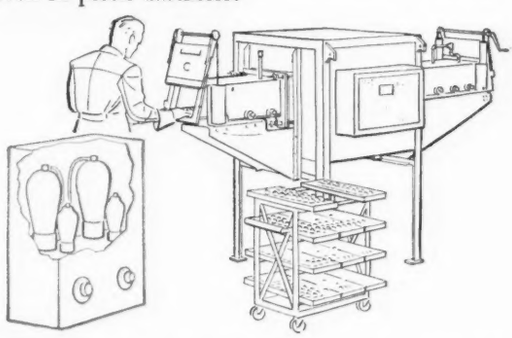
Saving Tons of Tin—Through electronic control of high-frequency induction heating, a coating of tin thirty millionths of an inch thick can now be "reflowed" to give a smooth, corrosion-resistant surface—requiring only *one-third* as much tin as previous methods.



Safe Night Landings for giant clipper planes are made possible by seadrome lights controlled by electronics. An entire landing lane can be turned on by shore radio to meet the arriving plane's requirements and guide it to a safe, sure landing, even in pitch darkness.



Removing Oil Mist created by gear-grinding and thread-grinding operations is a highly important application of PRECIPITRON—the Westinghouse electric air cleaner. By removing oil mist and returning clean air to the room, the load on air conditioning systems is reduced, oil smudge which reduces lighting efficiency is eliminated, health of operators is protected.



Heat-treating at 2000° C. can now be controlled more precisely than ever before—to insure absolute uniformity in treating metal alloys and chemicals. Minute variations in temperature activate an electronic control which increases or decreases current entering the furnace. The "Furnatron" is the most accurate control ever developed for resistance-type production furnaces.

J-91013

For further information on practical applications of Westinghouse Electronic devices, write or phone your nearest Westinghouse office, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

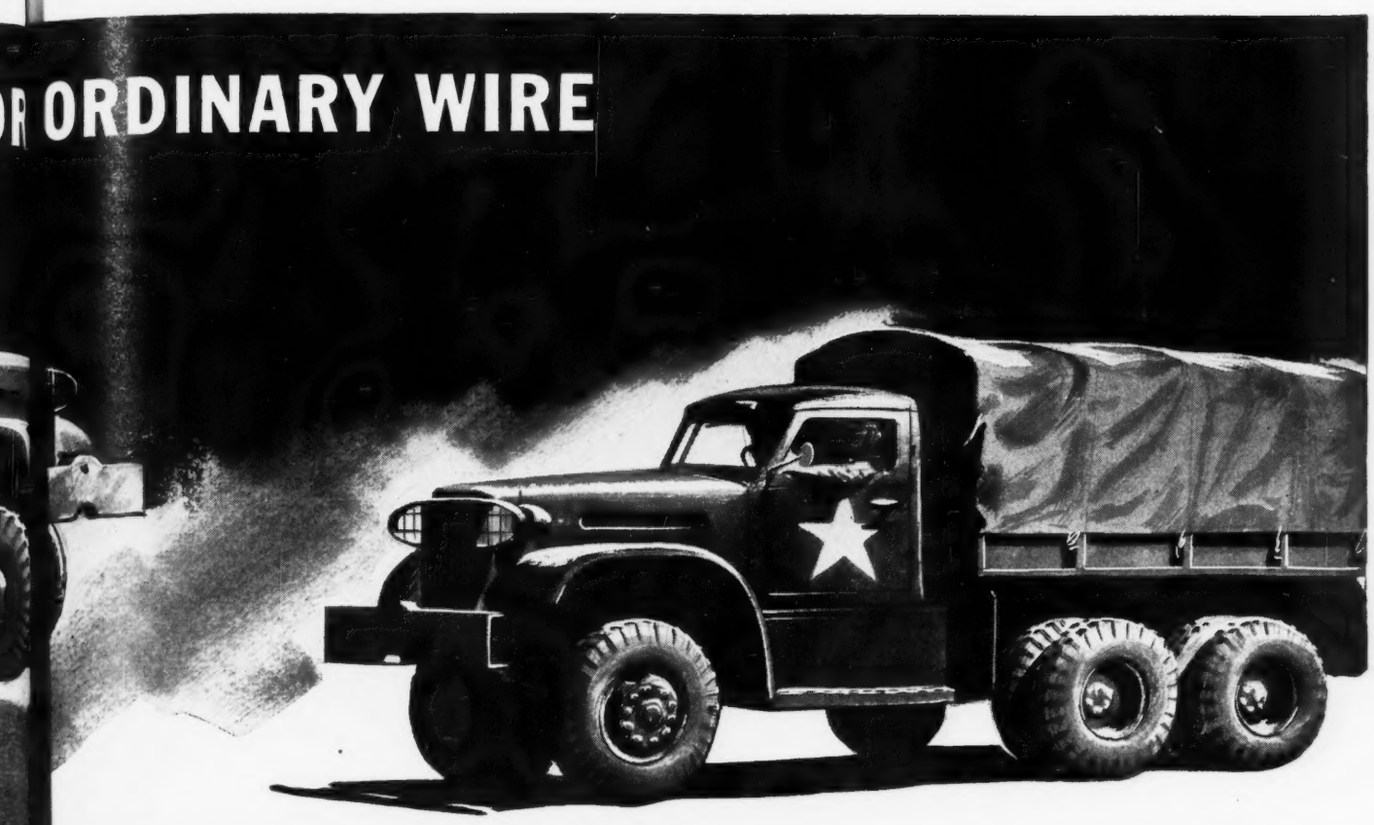
Westinghouse ELECTRONICS

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

1230 SIXTH AVENUE • ROCKEFELLER CENTER • NEW YORK

UNITED STATES

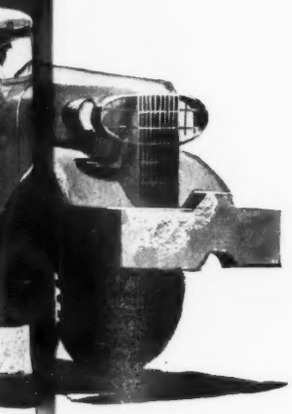
OR ORDINARY WIRE



1 TRUCK FOR U.S. Laytex ASSAULT WIRE

REG. U. S. PAT. OFF.

4 TRUCKS RELEASED FOR OTHER MATÉRIEL TRANSPORT



Every day our Armed Forces are in the field, distances from base to front lengthen... problems of transportation increase... every cubic foot of space that can be saved for the S.O.S. is vital.

U. S. Laytex Assault Wire requires only 1/5 *the space in transport of ordinary communications wire.*

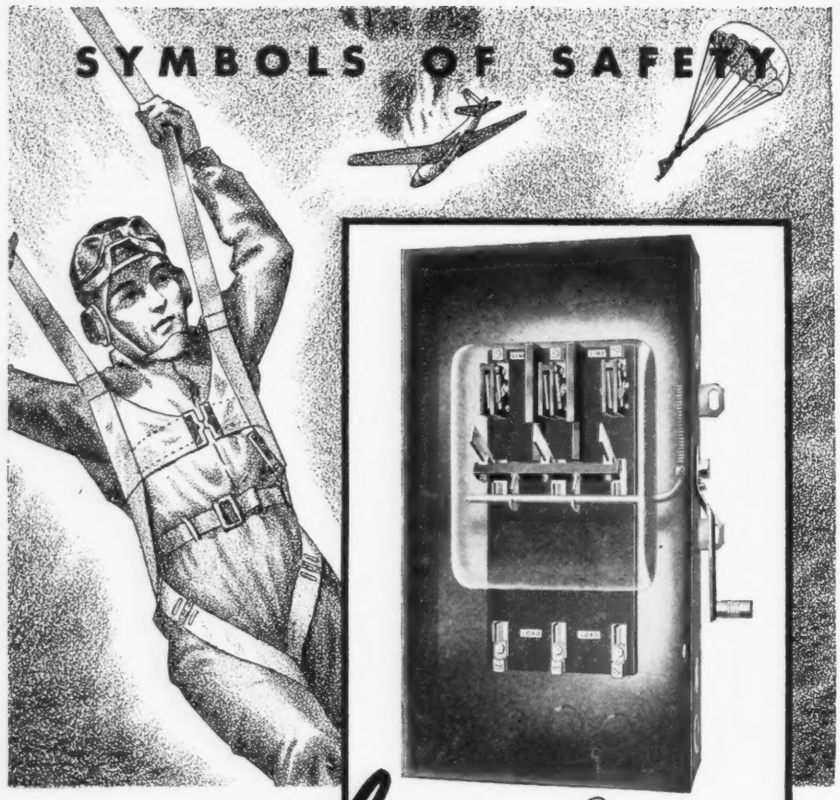
In the unique Laytex Process, the compounded, purified latex is applied to the electrical conductor by dipping. Conductors are perfectly centered and the weight of the insulation and the diameter of the insulated conductor are kept at the minimum.

Lightweight and small bulk are only two advantages of U. S. Laytex Assault Wire. It resists concussion and a wide range of temperature changes. Laytex is waterproof and extremely flexible.

Laytex Assault Wire weighs less than 30 lbs. per mile... a mighty important feature when men are marching with full equipment. It has a talking distance of five miles and a breaking strength of 50 lbs. per conductor.

UNITED STATES RUBBER COMPANY · US · TRADE MARK

RUBBER COMPANY



Federal Rolarc
SAFETY FACTORS

INCREASE PRODUCTION

When a switch fails machines stop—vital war production slows down. And one of the reasons for switch failure is uncontrolled arcing. That's why the Federal 575 Volt Rolarc Safety Switch* is built with special safety features to control and reduce arcing to an *absolute minimum*—and so to increase production by eliminating delays and accidents caused by switch failure.

Two parallel cylindrical rollers fabricated from high arc-resistant material form an insulating barrier to "dam up" and snuff the arc. This gives the Rolarc many added advantages that increase switch safety and service through perfect control of arcing.

Follow the leaders—for extra service and safety switch to Federal.

*100-600 Amperes only.

For Complete Rolarc Data

write for Bulletin 42-12. Contains all the essential facts on the Federal 575 Volt Rolarc Safety Switch.

SAN FRANCISCO 1260 Folsom Street Underhill 2367-8
LOS ANGELES 440 Seaton Street PRospect 0229
PORTLAND, ORE. 121 N.W. Fifth Avenue ATwater 5355—BEacon 4380

FEDERAL ELECTRIC PRODUCTS COMPANY
64 PARIS STREET NEWARK, N. J.

PANELBOARDS • SWITCHBOARDS • SAFETY SWITCHES • CIRCUIT BREAKERS

BOOKS *you may want*

DIESEL AND GAS ENGINE POWER PLANTS, by Glenn C. Boyer, 447 pages, 6 x 9, McGraw-Hill Book Co., $4. The author says in the preface that the book is primarily for the designer and operator of diesel and gas engine power plants. With this purpose in mind he has wisely omitted a discussion of engine details and design, and confined himself to those features which will enable one to select an engine suitable for the type of plant desired. It is well for the plant designer to realize that equipment design is highly specialized and should be left to the manufacturers. The designer should confine himself to the best selection of equipment available, and put it together in the most workmanlike and economical manner possible.

The subjects covered include performance, pipe line pumping stations, building, selection of the engine, fuels, lubrication, cooling, intake and exhaust systems, piping, waste-heat recovery, accessories, maintenance, and electrical equipment and layout.

Two items in connection with diesel and gas engine plants are matters of some uncertainty: (1) performance as to fuel and lubricating oil consumption, and (2) maintenance costs. In the chapter entitled *Power Plant Performance*, the author presents an analysis of cost data from the best sources available, which is the Reports on Oil-Engine Power Costs of the A.S.M.E.

On the whole, the book is a practical and rather complete resume of all the elements involved in diesel and gas engine plant design and should be helpful to designers as well as operators of such plants.—R. C. P.

AMERICAN STANDARDS FOR TRANSFORMERS, REGULATORS AND REACTORS, published by the American Standards Assn., 29 West 39th St., N. Y., 96 pages, 7¾ x 10¾, $1.25. Representing standard practice in the United States relating to transformers and other induction apparatus, this publication contains data gathered from various sources, including the established standards of AIEE and NEMA.

It combines in a single volume information relating to the terms and conditions upon which the rating and behavior of transformers and other induction apparatus are based (with special reference to the conditions upon which acceptance tests are made) and guides for testing such apparatus and its operation in service. Definitions covering the various types of apparatus coming within the scope of the work also are included.

A preliminary edition was published in 1940 for trial use during an 18-month period.

AMERICAN STANDARD FOR ROTATING ELECTRICAL MACHINERY on Railway Locomotives and Rail Cars and Trolley, Gasoline-Electric and Oil-Electric Coaches. Approved by the American Standards Assn. Jan. 6, 1943 and published by the American Institute of Electrical Engineers, 33 West 39th St., N. Y., 17 pages, 7¾ x 10½, 50c (member discount).

AMERICAN STANDARDS FOR MEASUREMENT OF TEST VOLTAGE IN DIELECTRIC TESTS. Approved by the American Standards Assn. Nov. 27, 1942 and published by the American Institute of Electrical Engineers, 33 West 39th St., N. W., 23 pages, 7¾ x 10½, 40c (discount to members).

600 V . . . CODE GRADE . . . GE
RP 600 V . . . PERFORMANCE GRADE
. . . 12 RH 600 V . . . HEAT RESISTANT GRA
. . . 12 RW 600 V . . . MOISTURE RESISTANT GRADE
. . . 12 EG 600 V-AC . . . IDENTIFIED GROUNDED WIRE

G-E LOOM BUS-DROP CABLE

This rugged cable can be hooked up easily from LVD or bus duct systems to machines. Use it on maintenance jobs, re-wiring jobs or new war wiring jobs. It will give long service. It is neat looking and is resistant to oils, grease, gasoline and moisture and is flame retarding.

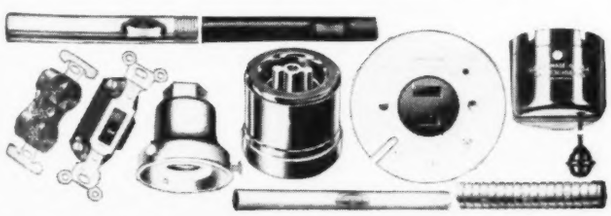
G-E BUILDING WIRE FOR WAR PURPOSES

This high quality wire is ideal for war jobs. It is easy stripping, clean stripping and easy pulling. You'll like to use G-E Building Wire and your customers will like the dependable service that it gives. Six grades of insulation are available: Type R, Code grade; Type RP, Performance grade; Type RH, Heat Resistant grade; Type RW, Moisture Resistant grade; Type EG, Neutral Conductor; Type SN, Flamenol small diameter synthetic insulated. Lead sheathed wires and cables are also available.

For further information on G-E Building Wires and Cables, Conduits, Boxes and Fittings or Wiring Devices see your G-E Merchandise Distributor or write to Section CDW-632-18, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

G-E CONDUITS AND WIRING DEVICES

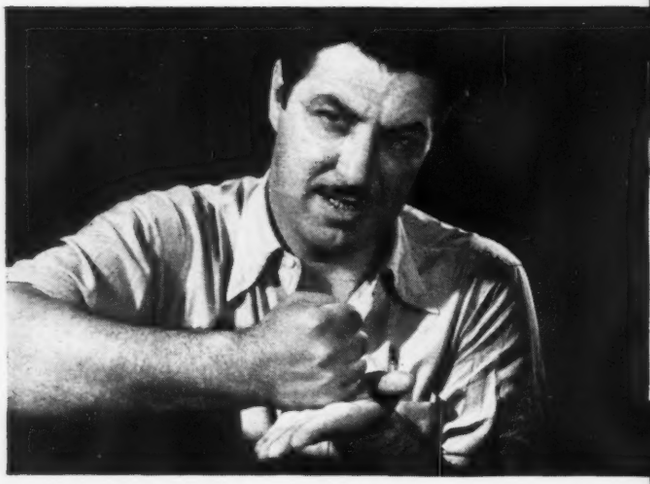
For your war needs General Electric also offers: G-E White hot-dipped galvanized conduit and G-E Black enamelled conduit, EMT, flexible metal conduit and hundreds of switches, lampholders, outlets, fuses, etc.



GENERAL ELECTRIC

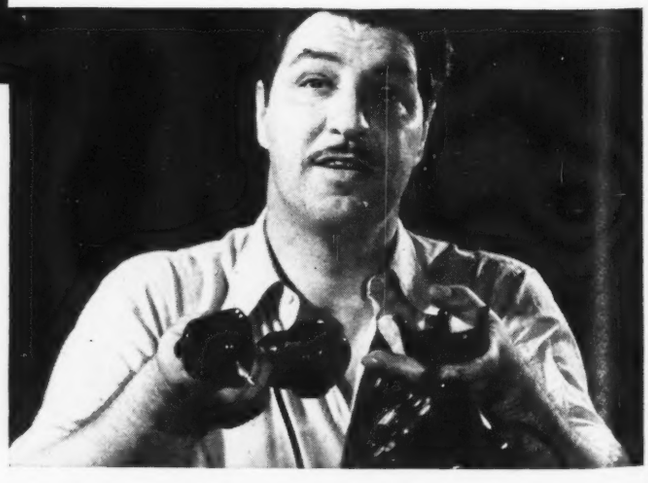
There is a way to KEEP CARBON DOWN!

1 If you think there is no way to cut down the amount of carbon that forms in your truck engines, you're in for a pleasant surprise. Because even the most confirmed skeptics on this carbon problem change their tune when they hear the *facts* about UNACAL TRUCK-BUS MOTOR OIL.



2 You see, Unacal Truck-Bus Motor Oil is no ordinary lubricant. It was built to reduce carbon formation. And it does just that for this simple reason... *it contains less of the elements that cause carbon!*

3 Unacal Truck-Bus Motor Oil is a 100% pure paraffin-base oil made by a special solvent refining process. This process gives it stability and freedom from carbon forming elements. It won't break down when the going gets tough, will stand terrific engine heat. In other words, *it stays on the job*, protects your equipment the way you want it protected.



4 So while you're thinking about it, call your Union Oil Resident Manager for a supply of Unacal Truck-Bus Motor Oil. He'll see that you get prompt delivery and friendly, courteous service.

UNION OIL COMPANY

Quick Answers

ON SWITCHGEAR APPLICATIONS

Today, when every minute of production time gained brings Victory that much closer, the Westinghouse TWO-FOLD Switchgear Service puts application on a wartime basis. It insures getting the *right* switchgear in the *minimum* time with the *least* expenditure of Critical Material.

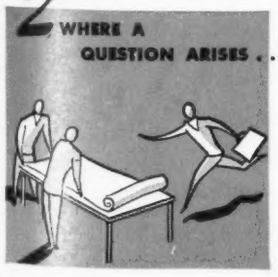
1 FOR STANDARD APPLICATIONS . . . THESE FOUR BOOKS ON "UNITIZED" SWITCHGEAR

B-3035 Heavy-Duty Oil | B-2273 Light-Duty Oil
B-3036 Heavy-Duty Air | B-2296 Low-Voltage Air

will save 30% of the time usually required to order, build, and install switchgear. Nowhere else can you find so much factual, easy-to-use switchgear information.

To order "Unitized" Switchgear, just (1) select units by number, (2) draw a single-line circuit diagram and specify capacities.

2 WHERE A QUESTION ARISES . . . APPLICATION ENGINEERS ARE AT YOUR CALL . . .



Always at hand to help, is a country-wide organization of Westinghouse Application Engineers and Switchgear Specialists. They will answer promptly all questions on the best way to handle a job. Use them to expedite selection and ordering. You can reach them at your nearest Westinghouse Office.

"UNITIZED" *switchgear makes expansion quick and easy.* New power requirements can be handled in a fraction of the time previously required. Ordering and manufacturing time are greatly reduced *and installation time has been cut as much as 60%.* Recently, a new unit was added to a "Unitized" Switchboard. Only 6 hours installation time was required instead of the 16 normally required with custom-built switchgear.

★ ★ ★

Take advantage of this TWO-FOLD Service. Call your nearest Westinghouse Office. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. J-60528

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

"UNITIZED" SWITCHGEAR

RE-LIGHTING
the new manpower / production *requirement*

HERE'S ONE ANSWER
to this problem...

This new folder tells the whole story. Send for it!

Because most plants operating today were designed for peacetime, *daylight* working schedules, *their lighting equipment is inadequate for night work!*

The folder illustrated gives one answer to industry's problem of *re-lighting*. Silv-A-King's new fluorescent reflectors of non-critical, metal-saving Silv-A-Tex are durable, efficient, inexpensive, and available for prompt delivery. For complete descriptions and specifications of Silv-A-King "Victory" units, write for a copy of "Catalog 43-V" today!

UL FLEUR-O-LIER SILV-A-KING RLM

SILV-A-KING
MAKES *Light* WORK FOR YOU

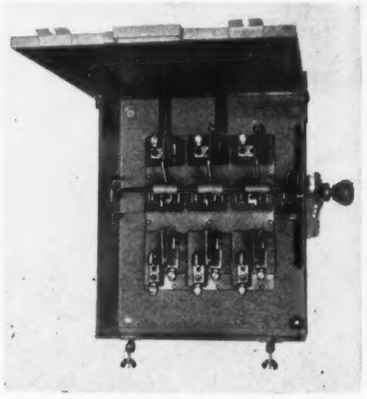
BRIGHT LIGHT REFLECTOR COMPANY, INC.
312 Morgan Avenue, Brooklyn, N. Y.

BROILKING AFTER THE WAR, MORE THAN EVER
America's Finest Electric Table Broiler
INTERNATIONAL APPLIANCE CORPORATION
1027 Metropolitan Avenue, Brooklyn, N. Y.

PRODUCTS
that are news

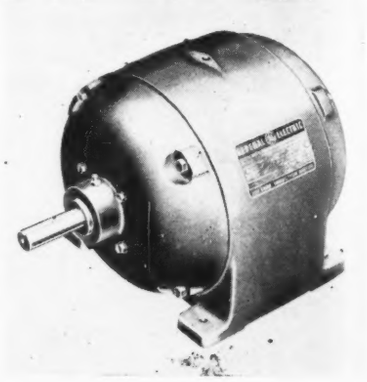
Marine Switches (600)

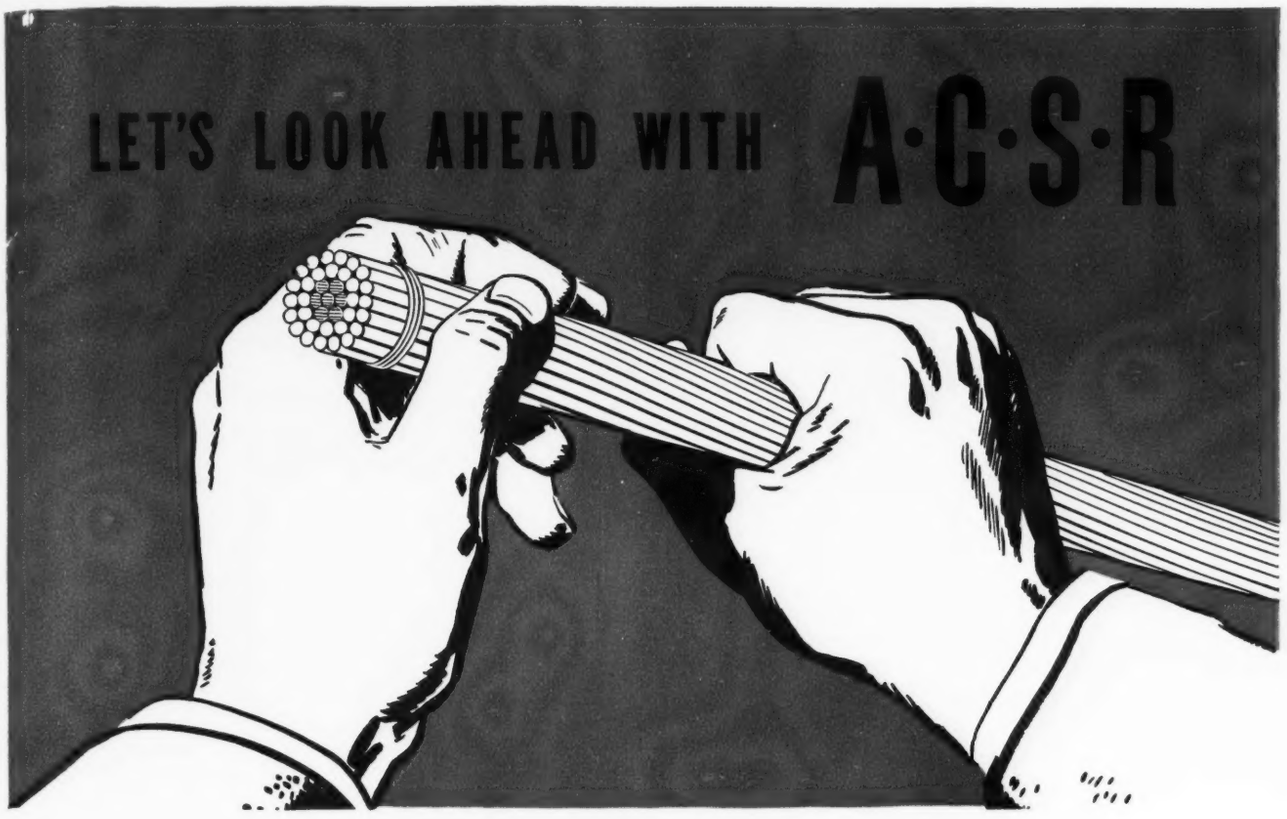
Square D Co. has announced a line of double-throw switches augmenting its single-throw Type K Marine switch and built to government requirements. These switches are splash proof and designed to withstand shock tests as specified by the Navy, the manufacturer states. They are available in two or three pole, from 30 to 100 amp., 250 volts a-c, d-c, 575 volts a-c, either fusible or not fusible. The 575 volt a-c switches have 250-volt fuse spacings.



Tri-Clad Motors (601)

General Electric has added a new line of totally enclosed Tri-Clad motors, which it states were especially designed for use under conditions where abrasives, chemicals, rain, snow and excessive dirt are encountered. The new motors are available in both the polyphase, 60-cycle, induction type and the single-phase, 60-cycle, capacitor type. The former are furnished in frame sizes 203 to 225 and include ½, ¾ and 1 hp. at 900 rpm; ¾, 1 and 1½ hp. at 1,200 rpm; 1, 1½ and 2 hp. at 1,800 rpm; and 1½ and 2 at 3,600 rpm. The single-phase motors are furnished in frame sizes 203 and 204 and include ¾ hp. at 1,200 rpm; 1 and 1½ hp. at 1,800 rpm; and 1½ and 2 hp. at 3,600 rpm. The mounting dimensions of these motors are said to be interchangeable with Tri-Clad open motors of the same rating.



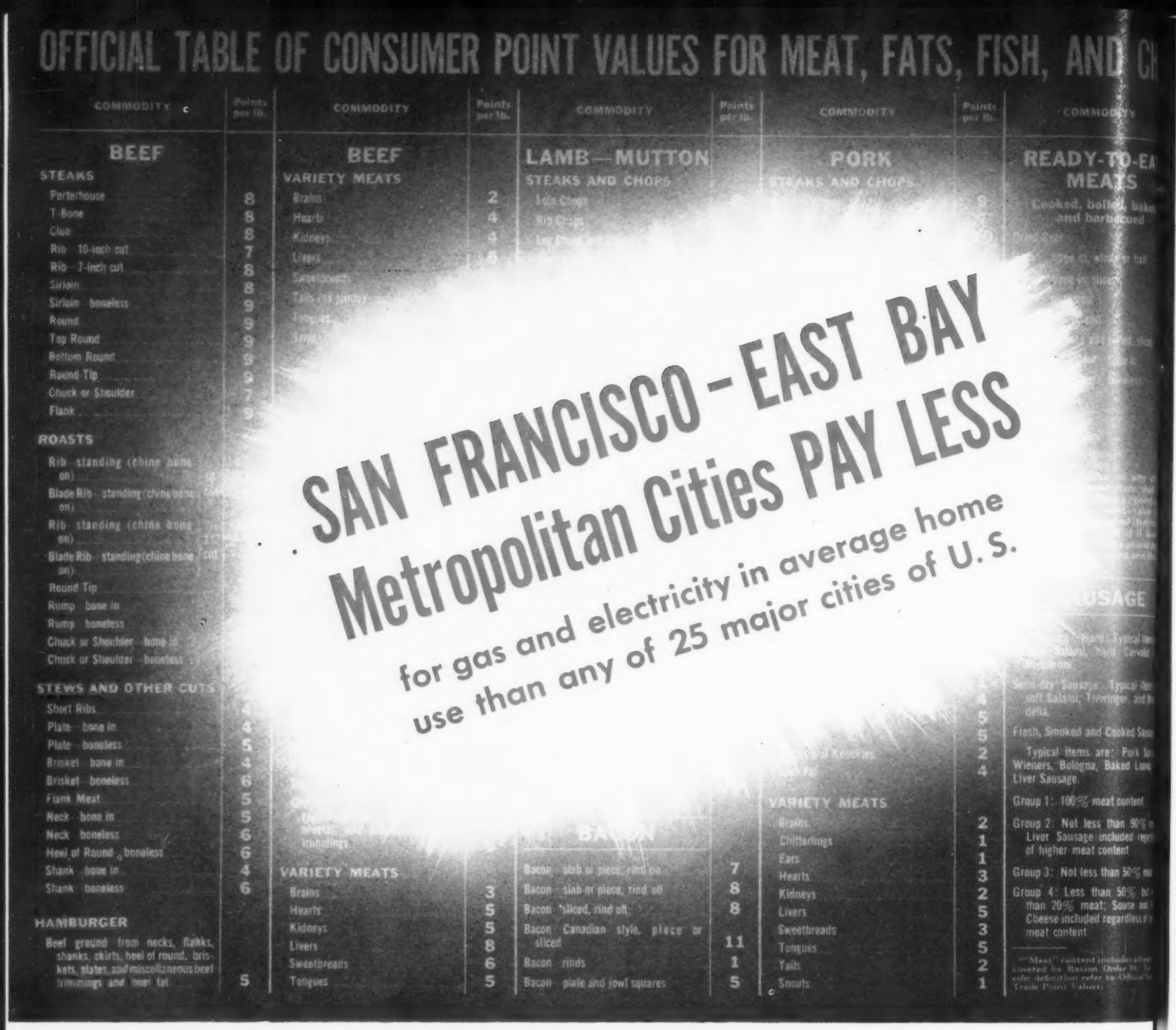


Voltages far above anything transmitted up to now are predicted for power lines of the near future. A fuller realization of the potentialities of electricity will make such superpower lines necessary. And with the development of those lines, an equally interesting future for A.C.S.R. is certain.

Look at the enviable record already established for Aluminum Cable Steel Reinforced: A thirty-year history of successful performance—a million miles bought for the construction of rural lines and hi-lines—some of this conductor has been in service over a quarter of a century. A.C.S.R. lines are carrying a large percentage of the power used by war industries today.

A.C.S.R. owes much of its success to this combination of properties: light weight with high strength and sturdiness, high electrical conductivity, ability to withstand corrosive attack. Too, Alcoa engineering has grown up with the industry, developing stringing standards, accessories, and a perfected system of vibration control, all as demanded by progress.

Those postwar, superpower lines will bring new design and construction problems. A.C.S.R. and Alcoa engineering intend to keep abreast of the trend. ALUMINUM COMPANY OF AMERICA, 2132 Gulf Building, Pittsburgh, Pa.


OFFICIAL TABLE OF CONSUMER POINT VALUES FOR MEAT, FATS, FISH, AND
SAN FRANCISCO - EAST BAY
Metropolitan Cities PAY LESS
for gas and electricity in average home
use than any of 25 major cities of U.S.

Bright Spot IN THE COST OF LIVING

SAN FRANCISCO and the Metropolitan East Bay cities lead the nation in the low cost of gas and electricity for average home use according to the recently-issued 1942 Annual Report of the California Railroad Commission, from which the figures in the accompanying table are taken.

Nearly all homes in this area use both gas and electricity. With rates at their present

low levels, the combined cost of these utility services is obviously one of the minor items of the household budget.

The Commission's report shows that not only bills for this average combination use of gas and electricity are higher in the only other Pacific Coast cities on the list, Los Angeles and Seattle, but that even their bills for 75 Kwh of electricity are higher. Los Angeles and Seattle operate municipally-owned electric systems, which are tax exempt. Out of every dollar of revenue collected in 1942 by P. G. and E., 23 cents were paid out in taxes.

This excellent position held by metropolitan users of P. G. and E. service is the result of six major cuts in the price of Natural Gas since its introduction here in 1930 and six major cuts in the price of Electricity since early in 1928.

Electricity costs you no more today than it did before the war. Gas actually costs you less. And they have not been rationed. Yet they should be used carefully and without waste.

Comparison of monthly Domestic bills for combination use of 75 Kwh of Electricity and 2,780 cubic feet of 1,100 Btu. Gas or its Equivalent.

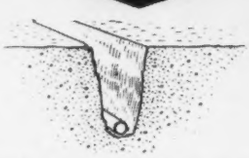
1. San Francisco-East Bay . . . $4.29

2. Cincinnati	$4.55	14. Minneapolis	$6.94
3. Los Angeles	4.62	15. Milwaukee	7.05
4. Pittsburgh	4.70	16. Denver	7.35
5. Cleveland	4.75	17. Chicago	7.63
6. Louisville	4.79	18. Philadelphia	7.71
7. Buffalo	4.90	19. Baltimore	7.73
8. Houston	5.04	20. Indianapolis	7.79
9. New Orleans	6.00	21. New York	9.02
10. Washington, D. C.	6.04	22. Rochester	9.32
11. Kansas City, Mo.	6.12	23. Newark	9.66
12. Detroit	6.55	24. Boston	9.89
13. St. Louis	6.83	25. Seattle	10.53

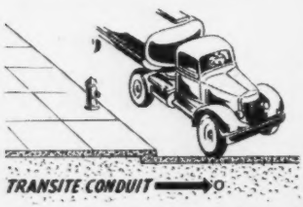
P·G·and E· PACIFIC GAS AND ELECTRIC COMPANY

DO YOU KNOW THESE FACTS ABOUT TRANSITE DUCTS?

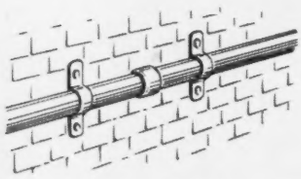
TRANSITE CONDUIT



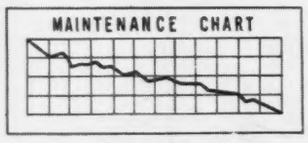
This durable duct is for use underground, or on exposed locations without a protective casing . . .



Under sustained earth loads and traffic pressure, it maintains its strength and true form . . .



Transite Conduit effectively resists weather, smoke and fumes...is virtually unaffected by corrosive soils...



Its cost is low and, in service, it is much more economical than other materials of comparable strength and durability.

. . . In addition, both Transite Conduit and Transite Korduct have these characteristics . . .

1. Incombustible—Made of asbestos and cement, they cannot burn . . . will not contribute to the formation of dangerous smoke, fumes or gases.

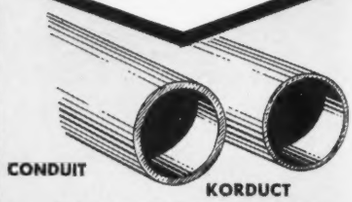
2. Immune to electrolysis . . .Transite Ducts are non-metallic and inorganic . . . unaffected by electrolysis.

3. Smooth bore—Making cable pulls easier, both at initial installation and after years of service.

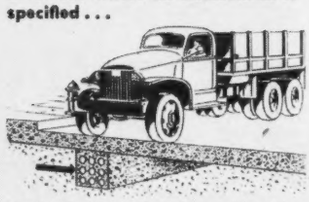
4. Easily installed—Lining up is fast and accurate because Transite Ducts combine light weight, long lengths, simple assembly.

For details and specifications, write for Data Book DS-410. Johns-Manville, 22 E. 40th St., New York.

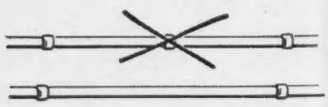
TRANSITE KORDUCT



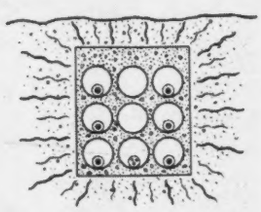
Thinner walled, lower priced than Transite Conduit, Transite Korduct is for use where an encasement is specified . . .



Because Korduct is incombustible, less concrete is required between ducts to provide the necessary degree of fire protection.



Its long lengths (10 feet) mean fewer joints, reducing the number of spacers required . . .



Its high rate of heat dissipation lowers cable operating temperatures . . . increases system capacity . . .

JM Johns-Manville

TRANSITE DUCTS

TRANSITE KORDUCT— for installation in concrete

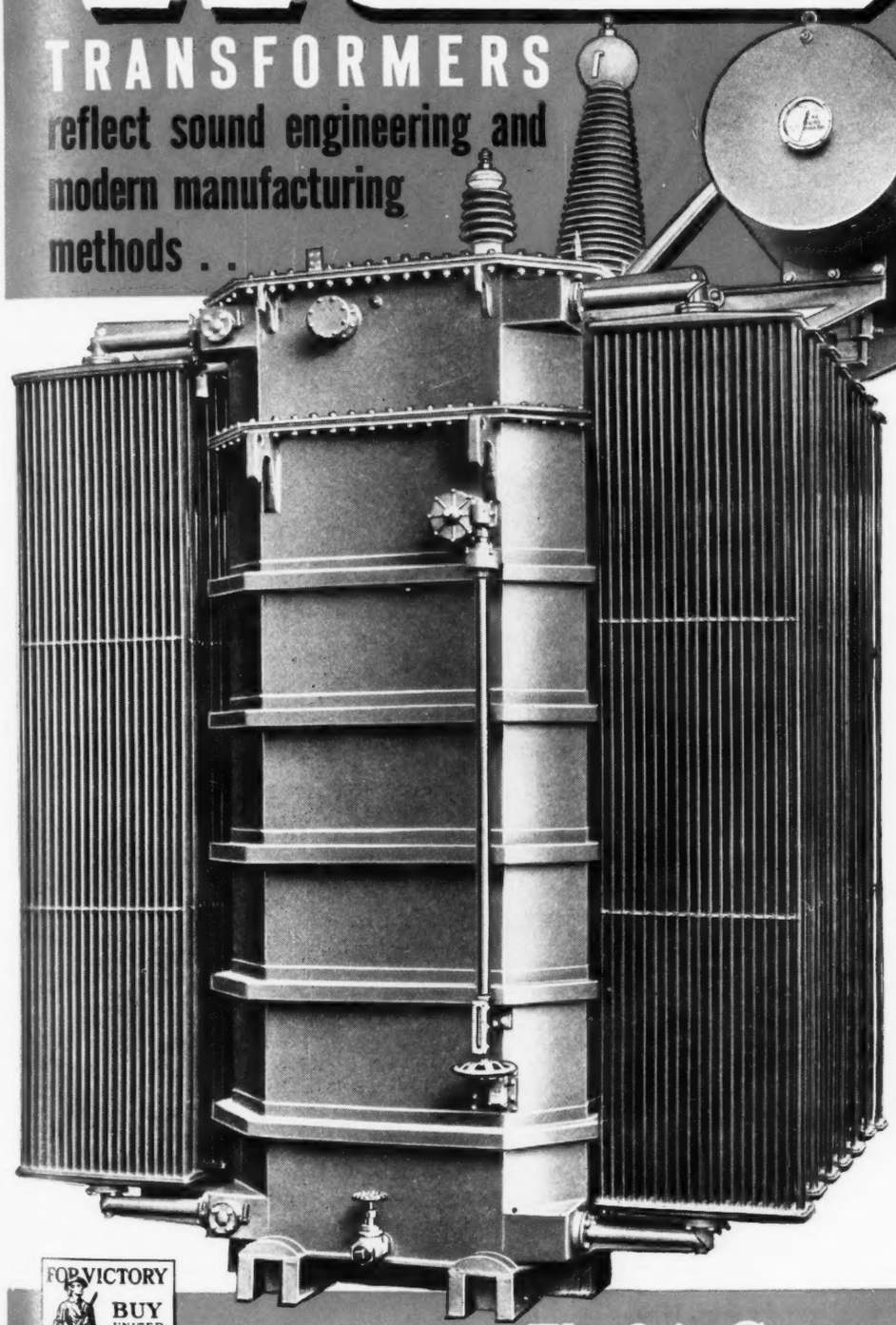
TRANSITE CONDUIT— for exposed work and installation underground without a concrete encasement

In time of war and in time of peace . . .

Wagner

TRANSFORMERS

reflect sound engineering and modern manufacturing methods . .



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DISTRIBUTION
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AIR-COOLED
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NOFLAMOL
(NON-INFLAMMABLE LIQUID FILLED)

★

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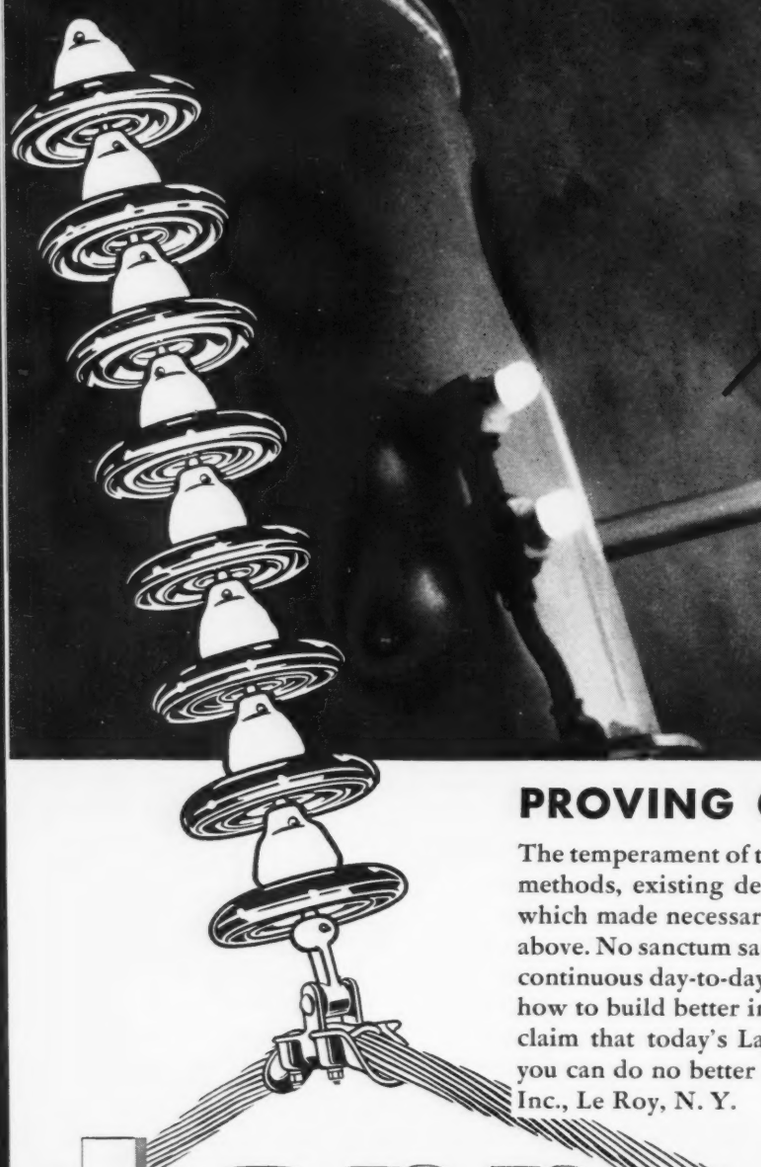
FOR BULLETINS
TU-33 (NOFLAMOL)
TU-181 (POWER)
TU-180 (DISTRIBUTION)

T43-3.

Wagner Electric Corporation
ESTABLISHED 1891
6400 Plymouth Avenue, St. Louis, Mo., U. S. A.
ELECTRICAL AND AUTOMOTIVE PRODUCTS

IT'S THE *PORCELAIN* THAT INSULATE



PROVING GROUND FOR INSULATORS . .

The temperament of the Lapp organization is that of dissatisfaction with existing methods, existing designs. It is this spirit which produced the Line Post and which made necessary the Lapp laboratory, a corner of which is photographed above. No sanctum sanctorum, this laboratory is truly an engineers' workshop, in continuous day-to-day use, testing, discarding, proving new designs. As we learn how to build better insulators, we build them. Meanwhile, we feel secure in our claim that today's Lapp insulators are adequately suited to today's needs, that you can do no better than to insulate your lines with Lapp. Lapp Insulator Co., Inc., Le Roy, N. Y.

ARMY E NAVY

Lapp

Better Porcelain • Better Insulators

BLAW-KNOX *Electroforged* GRATING

AFE: twisted bar does the trick STRONG: one piece electroforged CLEAN: no sharp angles to clog

EASY TO PAINT · OPEN FOR LIGHT AND AIR

Whatever your grating needs—here's how to select the proper size.

WHAT TO SPECIFY WHEN ORDERING BLAW-KNOX ELECTROFORGED GRATING

- Size of bars and type.
- Painted or galvanized.
- Dimensions of area to be covered.
- Direction bearing bars are to run.
- Is clearance to be allowed.

BLAW-KNOX ELECTROFORGED STAIR TREADS

These treads are designed for the development of unusual strength against impact. Standard sizes and specifications follow:

Abrasive	Diamond Plate	TYPE "J" — 1″ x 3/16″ BARS		
Width	Width	Min. Length	Suggested Max. Length	A
6 3/4″	6 1/16″	1′6″	3′0″	2 1/2″
7 11/16″	7 1/4″	1′6″	3′0″	4 1/2″
9 1/8″	8 7/16″	1′6″	3′6″	4 1/2″
10 5/16″	9 5/8″	1′6″	3′6″	7″
11 1/2″	10 13/16″	1′6″	3′6″	7″

Abrasive	Diamond Plate	TYPE "L" — 1 1/4″ x 3/16″ BARS		
Width	Width	Min. Length	Suggested Max. Length	A
7 11/16″	7 1/4″	2′0″	4′0″	4 1/2″
9 1/8″	8 7/16″	2′0″	4′0″	4 1/2″
10 5/16″	9 5/8″	2′0″	4′0″	7″
11 1/2″	10 13/16″	2′0″	4′6″	7″
12 11/16″	12″	2′0″	4′6″	7″

BLAW-KNOX DIVISION
OF BLAW-KNOX CO.
2072 FARMERS BANK BUILDING PITTSBURGH, PA.

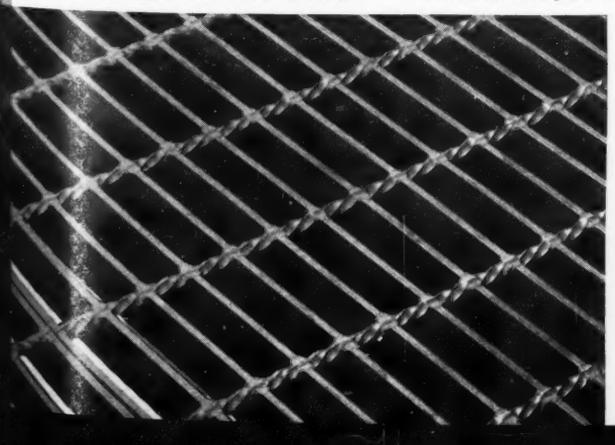


TABLE OF SAFE LOADS BLAW-KNOX ELECTROFORGED GRATING

SIZE OF BEARING BARS 1 IN. APART

Span, ft.-in.		2-0	2-6	3-0	3-6	4-0	4-6	5-0	5-6	6-0	6-6	7-0	8-0	9-0
3/4x1/8	U	330	222	143										
	D	.085	.134	.192										
	C	330	265	215										
	D	.068	.108	.154										
3/4x3/16	U	500	320	217										
	D	.085	.134	.192										
	C	500	400	325										
	D	.068	.108	.154										
1x1/8	U	600	384	267	188	150								
	D	.064	.099	.143	.195	.256								
	C	600	480	400	330	300								
	D	.051	.080	.115	.156	.205								
1x3/16	U	900	580	400	286	225								
	D	.064	.099	.143	.195	.256								
	C	900	725	600	500	450								
	D	.051	.080	.115	.156	.205								
1 1/4x1/8	U	950	600	420	303	232	184	146	120					
	D	.051	.081	.115	.157	.205	.259	.321	.389					
	C	950	750	630	530	465	415	365	330					
	D	.041	.064	.092	.125	.163	.207	.256	.310					
1 1/4x3/16	U	1425	900	633	457	350	278	220	182					
	D	.051	.081	.115	.157	.205	.259	.321	.389					
	C	1425	1125	950	800	700	625	550	500					
	D	.041	.064	.092	.125	.163	.207	.256	.310					
1 1/2x1/8	U	1365	880	610	445	340	266	220	182	150	128	110		
	D	.043	.067	.094	.131	.166	.216	.267	.324	.385	.440	.522		
	C	1365	1100	915	785	680	600	550	500	450	415	385		
	D	.034	.053	.077	.104	.137	.173	.214	.259	.308	.361	.418		
1 1/2x3/16	U	2050	1320	917	672	512	400	330	273	225	192	164		
	D	.043	.067	.094	.131	.166	.216	.267	.324	.385	.440	.522		
	C	2050	1650	1375	1175	1025	900	825	750	675	625	575		
	D	.034	.053	.077	.104	.137	.173	.214	.259	.308	.361	.418		
1 3/4x3/16	U	2800	1780	1230	915	700	544	440	364	308	262	228	175	133
	D	.038	.057	.082	.112	.147	.185	.229	.276	.330	.387	.450	.580	.737
	C	2800	2225	1860	1600	1400	1225	1100	1000	925	850	800	700	600
	D	.029	.046	.066	.090	.117	.148	.183	.221	.264	.308	.358	.468	.593
2x3/16	U	3650	2340	1618	1200	912	723	580	482	400	346	293	225	178
	D	.032	.050	.072	.099	.128	.163	.201	.243	.289	.341	.397	.516	.651
	C	3650	2925	2425	2100	1825	1625	1450	1325	1200	1125	1025	900	800
	D	.026	.040	.057	.078	.102	.129	.160	.193	.230	.269	.314	.409	.518
2 1/4x3/16	U	4650	2960	2065	1515	1150	912	740	608	516	438	379	288	228
	D	.027	.044	.064	.087	.113	.148	.177	.214	.255	.305	.349	.455	.574
	C	4650	3700	3100	2650	2300	2050	1850	1675	1550	1425	1325	1150	1025
	D	.023	.035	.051	.070	.091	.115	.142	.172	.204	.240	.279	.364	.460

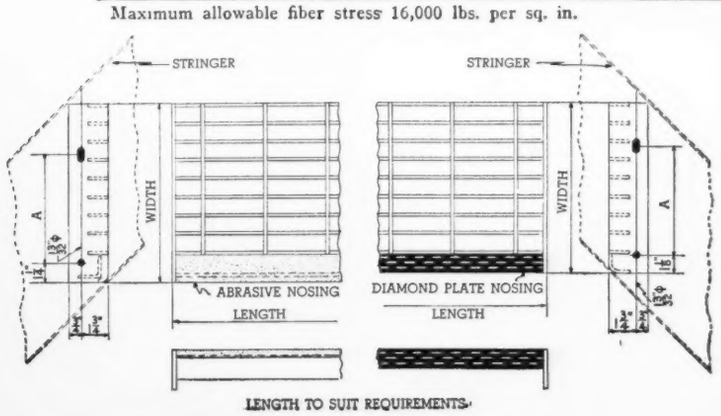
C — Safe concentrated load in pounds per foot of width

U — Safe uniform load in pounds per foot of width

D — Deflection in inches

Spans to right of heavy line not recommended

Maximum allowable fiber stress 16,000 lbs. per sq. in.



LENGTH TO SUIT REQUIREMENTS

"PROVED IN" LONG AGO FOR RURAL LINES

IN SERVICE SINCE 1936

Crapo Steel Conductor in rural primary distribution line. Location: Texas. Average span length, 600 feet.

Crapo STEEL CONDUCTOR

The operating efficiency of *Crapo* Steel Conductors was established long before the present emergency. Thousands of miles of these high-tensile, low-resistance steel conductors have been giving efficient, reliable and economical service on rural lines since 1936.

Crapo Steel Conductors afford an unique combination of electrical characteristics and physical properties never before attained in a ferrous conductor. They provide relatively low 60-cycle resistance, low magnetic permeability and low 60-cycle reactance. Their high-tensile strength permits the use of long-span, low-cost construction; saves man-hours and material; reduces maintenance problems.

Crapo Steel Conductors can be handled and "pulled in" with the same facility as any other conductor. For rural extensions authorized by Utilities Order U-1-c, specify *Crapo* HTC-130 in No. 6 B.W.G. Stranded (3-wire) — the type recommended for this purpose. Ask the representatives of the Graybar Electric Company Inc., Distributors, or contact the nearest Graybar office!

WRITE FOR NEW ENGINEERING MANUAL containing complete technical information on *Crapo* Steel Conductors, including electrical characteristics and performance, sag and tension data and applicable construction practices! Address:

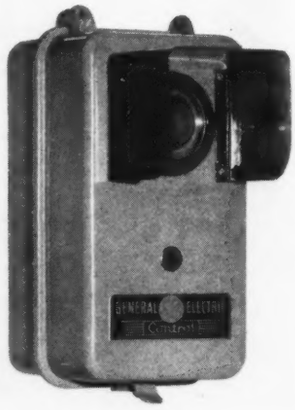
INDIANA STEEL & WIRE COMPANY
MUNCIE, - - INDIANA

Crapo HTC-130 STEEL CONDUCTORS

Photoelectric Relay (602)

A general-purpose outdoor photoelectric relay has been designed by General Electric Co. for applications requiring counting, controlling, sorting or limiting operations. Its contacts control 2 amp. at 115 volts, 25 to 60 cycles, a-c, or 0.5 amp. at 115 volts d-c.

According to the manufacturer, a pliotron tube, used in addition to the Type GL-930 phototube, has a filament which operates on full line voltage, thus eliminating need for a filament transformer. This amplifier tube also incorporates a diode rectifier



which functions when a-c power supply is used.

The relay can be mounted in any position and can be adjusted under operating conditions, without removing the cover, it is stated.

Protection System (603)

A photoelectric protection system projecting a fence of invisible light over distances as great as 1,500 ft., and providing instant alarm if an intruder enters the protected area has been developed by Photoswitch Inc.

In operation, the light source is aligned with a receiver to which it focuses a modulated beam of infrared light. Because the receiver responds only to the frequency of light emitted from the light source, it is not affected by other artificial light or by daylight. If invisible infrared light is not required, the operating range of the system exceeds 2,000 ft., according to the manufacturer.

When the invisible beam of light projected to the receiver is momentarily broken, the alarm circuit latches in operation. Either power or tube failure will cause the alarm circuit to operate as though the light beam had been broken, the manufacturer states.

Rechargeable Battery (604)

Ideal Commutator Dresser Co. suggests its rechargeable storage battery as an answer to limited flashlight dry cell production. Introduced about three years ago, this type of cell was designed mainly for industrial and utility service. It is small in size to fit all popular two-cell, 1¼-in. size D flashlight cases, according to the manufacturer, who states that each battery can replace up to 400 or more dry cells. Battery chargers are available both in single and gang types for use on both alternating and direct-current.

HOT ARCS STOPPED COLD!

BullDog's Vacu-Break Safety Switch with "Clampmatic" Contacts provides the faster, tighter closing — and quicker, smoother opening — needed for safest, most dependable operation at lowest maintenance cost.

ON "Clampmatic" switch contacts exert a wedging action when engaged with the beveled ends of the stationary contact prongs. This wedging action puts great pressure on the movable slug, for positive pressure contact in ON position.

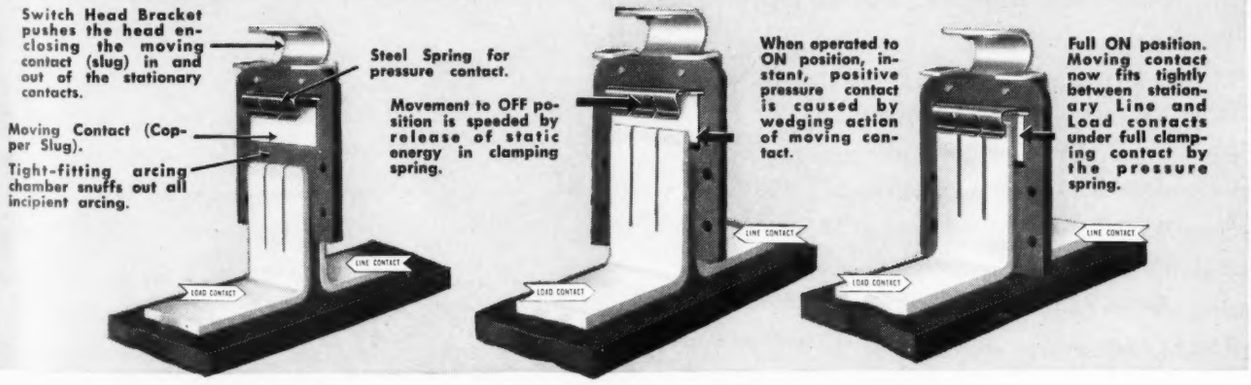
OFF When the handle is pushed to OFF position, the static energy stored in clamp spring helps make an easier, smoother separation of contacts. This quick-break operation in the close-fitting arc chamber creates a MAGNETIC BLOWOUT effect which quickly dissipates arcing.

Streamlined, push type, front-operated rocker handle *inside* cabinet lines.

BULLDOG *Vacu-Break* SAFETY SWITCH

with "Clampmatic" Contacts and front-operated Rocker Handle.

In these illustrations the formed bakelite covers (arcing chambers) have been removed from switch head to show action.


Switch Head Bracket pushes the head enclosing the moving contact (slug) in and out of the stationary contacts.
Moving Contact (Copper Slug).
Tight-fitting arcing chamber snuffs out all incipient arcing.
Steel Spring for pressure contact.
Movement to OFF position is speeded by release of static energy in clamping spring.
When operated to ON position, instant, positive pressure contact is caused by wedging action of moving contact.
Full ON position. Moving contact now fits tightly between stationary Line and Load contacts under full clamping contact by the pressure spring.
LINE CONTACT
LOAD CONTACT

BULLDOG
ELECTRIC PRODUCTS CO.
Detroit, Michigan

BullDog Electric Products of Canada, Ltd., Toronto, Ontario
Field Engineering Offices in All Principal Cities

MANUFACTURERS OF Vacu-Break Safety Switches, SafToFuse Panelboards, Circuit Master Breakers, Switchboards, Bus Duct Systems—FOR LIGHT AND POWER.

BUY MORE WAR BONDS

BULLDOG PRODUCTS ARE SOLD AND DISTRIBUTED BY THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

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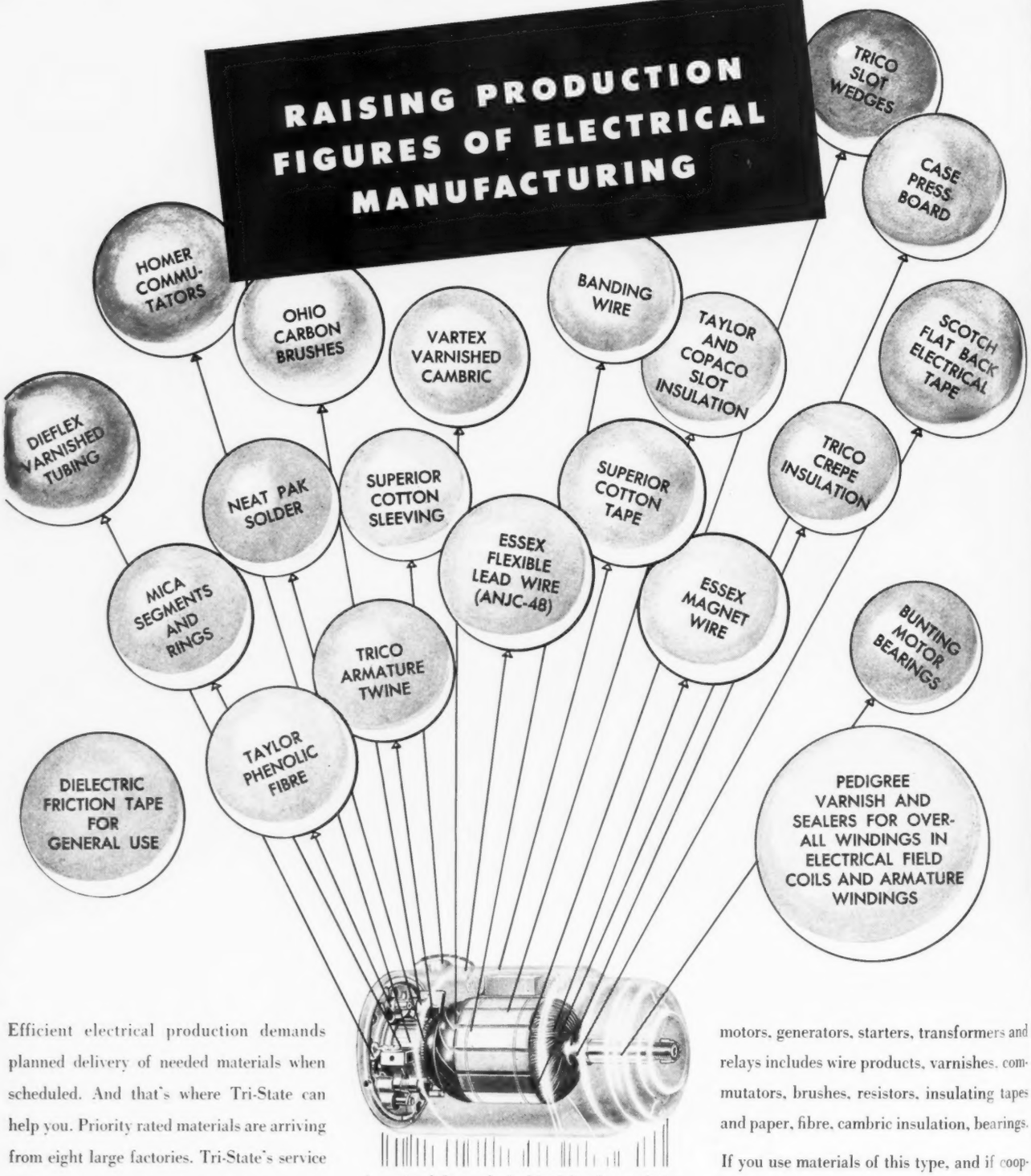
Safety Switchboard & Manufacturing Co.
1445 Stevenson St.
San Francisco, Calif., Tel. Hemlock 2470

Mullenbach Electrical Manufacturing Co.
2300 East 27th Street
Los Angeles, Calif., Tel. Jefferson 2224

RAISING PRODUCTION FIGURES OF ELECTRICAL MANUFACTURING



Efficient electrical production demands planned delivery of needed materials when scheduled. And that's where Tri-State can help you. Priority rated materials are arriving from eight large factories. Tri-State's service engineers, headquartered in both Los Angeles and San Francisco, are experienced in solving supply problems. And the entire organization is trained for today's big job of expediting deliveries to war plants of the West.

Tri-State's complete line of necessities for motors, generators, starters, transformers and relays includes wire products, varnishes, commutators, brushes, resistors, insulating tapes and paper, fibre, cambric insulation, bearings.

If you use materials of this type, and if cooperation in securing them will help you speed production and maintenance—write or wire for more details of Tri-State's services.

TRI-STATE SUPPLY CORPORATION

LOS ANGELES
544 S. San Pedro St.
MUtual 2354

SAN FRANCISCO
554 Bryant St.
EXbrook 8890

PROOF-TESTED

. . . to 50% of the guaranteed minimum

Although the published strengths of all Locke Suspension Insulators are guaranteed minimums, you wouldn't think of loading them up to that value. But you can load them safely up to 50% of the guaranteed minimum because every unit is proof tested to that before it leaves the factory.

When you install Locke Suspension Insulators, you are installing a reserve strength that means greater immunity to damage, longer life and lower upkeep . . . which is one reason why comparative service records so invariably show more satisfactory performance from Locke Suspension Insulators.

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COMPRESSION
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PORCELAIN INSULATORS

LOCKE INSULATOR CORPORATION, BALTIMORE, MD.

OUR NAME MAYDWELL SPELLS QUALITY

MAYDWELL & HARTZELL
INCORPORATED

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Victor Porcelain Insulators
Pole Line Hardware
Gardner Transformers
Glass Insulators
Wires and Cables
Poles and Crossarms
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MUtual 7245

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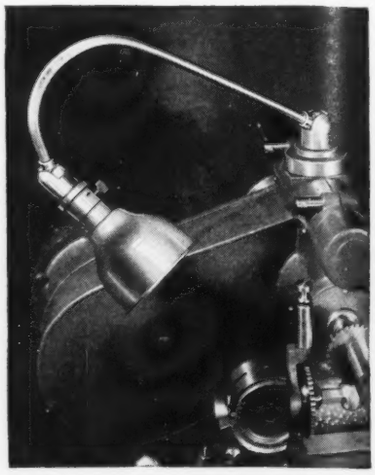
1016 First Ave. South,
ELiot 5007

Work Light (605)

Reliance Devices Co. is manufacturing a new line of Swivelier Work-Lites designed for close tolerance and assembly work. These machine-lighting units are claimed to be unaffected by vibration and to have a wide range of movement. According to the manufacturer, the socket adjusts to full 90° vertical range and rotates 350° horizontally, and the arm in base has similar



range. Spring tension construction is said to hold the unit in place at any angle. Available in a choice of arm lengths, of base and socket combinations and of shades.

Electronic Drive (606)

An electronic adjustable-speed drive for such applications as machine tool feeds, winding reels, conveyors, fabricating and converting machinery has been designed by Westinghouse Electric & Mfg. Co. Called the Mot-O-Trol, this drive is said to provide close speed regulation over a 20 to 1 speed range for d-c motors operating from an a-c source.

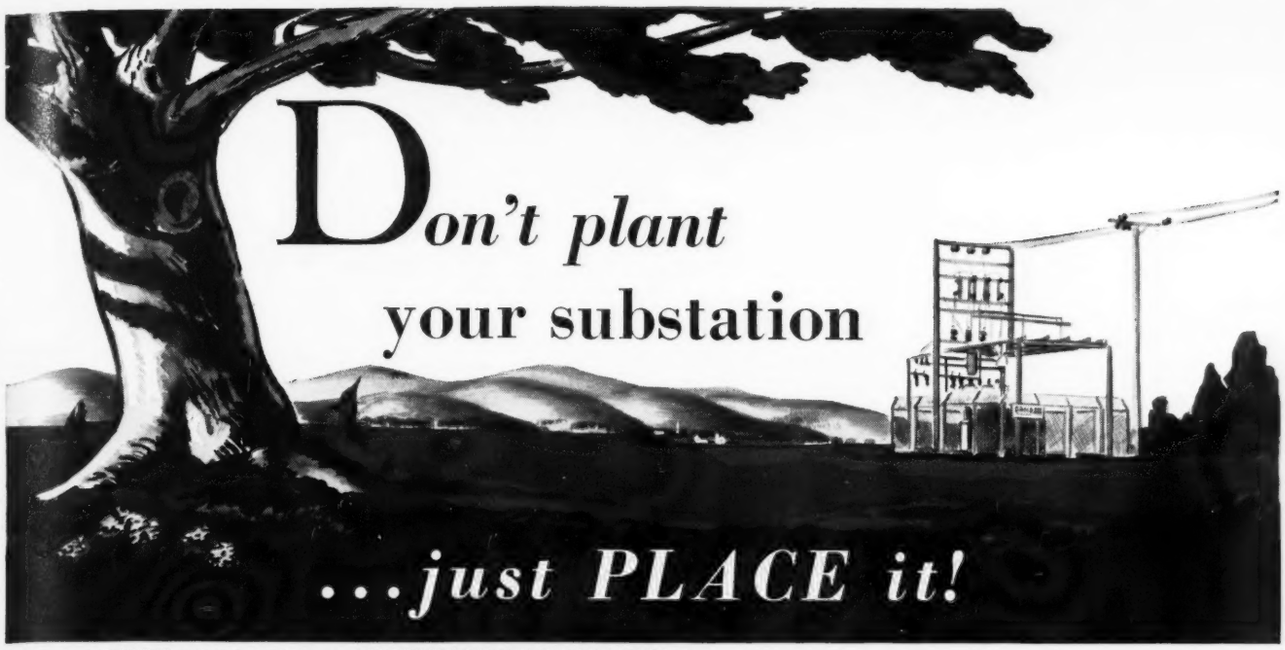
Features announced by the manufacturer include stepless speed control, automatic close speed regulation over wide load fluctuations, full torque at extremely low speeds, smooth stepless acceleration and deceleration and dynamic braking. At present a standard drive is available for ratings up to 1 hp. for single phase operation on 110 or 220-volt, 60-cycle systems. Special drives of larger horsepower ratings can be designed to suit particular application requirements, according to the announcement.

Lighting Transformer (607)

General Electric has announced a new series-multiple lighting transformer, which provides for operation of a floodlight or searchlight from a series lighting circuit. This transformer is constructed with a built-in film cutout open circuit protective wiring device, which eliminates the necessity of mounting and wiring a separate protective device. It is designed to operate a standard 115-volt multiple flood or searchlight.

Abraser Attachment (608)

An abraser attachment for measuring toughness quality of surface finishes and their ability to resist abuse has been announced by the Taber Instrument Corp. According to the manufacturer, only a 4 in. sq. sample is required to make a test with this shear-hardness attachment.



UNIT SUBSTATIONS

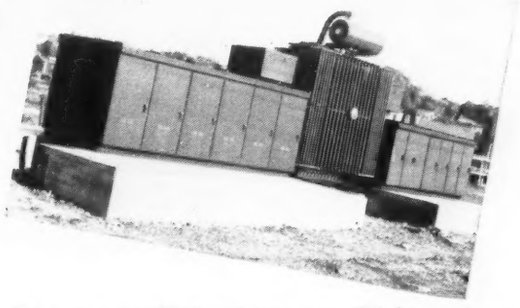
are quickly installed and easily moved

WAR-PRESSED utilities and industrials are greatly accelerating the already-strong trend from *piecemeal* to *unit* substations—from *planting* a substation piece by piece to *placing* it as a unit. Unit design means quick installation, and it means you can easily move your substation to follow load shifts.

Actually, the advantages of unit substations begin with their selection. You can select a complete, standard substation as one unit, order it with a simple functional specification, and have it shipped—*factory assembled*—weeks sooner than would be possible for a piecemeal assembly.

Then, by installing these compact, safety-enclosed units right at load centers, you can greatly shorten secondary runs, save precious copper by the ton.

Finally, you have a *co-ordinated* substation—every part designed to fit and function with every other part. Engineers see the benefits in remarkable service records. And everyone appreciates the vastly improved appearance, which gives greater flexibility of installation in urban areas.



Factory-assembled sections are slid into place quickly. The substation can be moved elsewhere just as easily, should it become desirable.

Our attractive, new 36-page bulletin will give you useful information. Ask your G-E office for GEA-3800 or write direct to General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

202-16-5900

GAS-FILLED CABLE *takes a*

NOW

MEDIUM-PRESSURE "GF" F

HERE is an extension in the operating range of gas-filled cable that gives you all the advantages of low-pressure "GF"—the cable which has given years of satisfactory service on circuits from 10 to 40 kv. This new *medium-pressure* cable is designed for high-voltage circuits from 40 to 69 kv.

To you, the most important feature about this cable is that it is just as easy to install and maintain as is the low-pressure "GF."

How the operating range was extended

This higher operating range has been made possible by increasing the inside pressure to 45 psi, as compared with the 15 psi for the low-pressure cable. Moreover, the same high factor of safety that is built into low-pressure "GF" has been retained in this new cable.

For more detailed information on "GF" cable—

1. Write for Bulletin GEA-3652. You will want to keep this publication for your files; it contains information on what "GF" cable is, how it is used, its performance and advantages, and the accessories needed.

2. The advice and experience of G-E cable engineers are always available to you. Call on your G-E office at any time. One of our cable specialists will be glad to discuss with you this new voltage range of "GF" cable and its possibilities. *General Electric, Schenectady, N. Y.*

4 advantages of "GF" cable

1. Easy to install—no auxiliary manhole equipment
2. Only routine inspection and maintenance—no specially trained personnel needed
3. No profile problem—no compound migration
4. Self-supervision—prompt, automatic warning if a leak occurs

another step forward

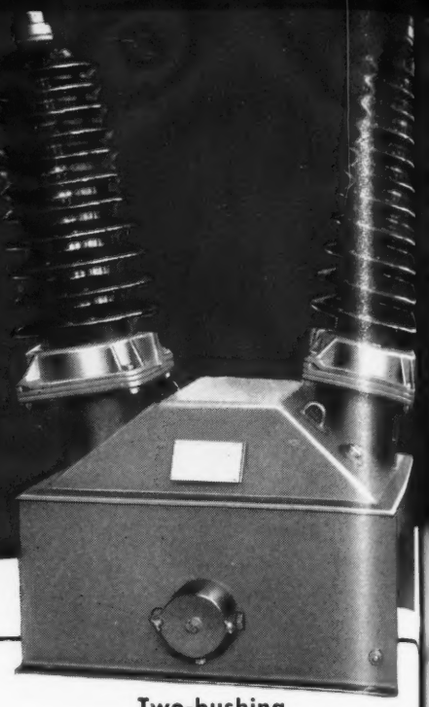
FOR 40- to 69-KV SERVICE

GENERAL ELECTRIC

501-18-1200

You Wanted them Smaller

HOW'S THIS?



Two-bushing
Outdoor Potential Transformers
Type E-236 (Supersedes Type E-116
Pyranol or Oil-filled
24 to 69 kv

Height reduced . . . . . 15 to 50 per cent
Weight reduced . . . . . 10 to 60 per cent
Liquid volume reduced . . . . . 45 to 90 per cent

You Can Put Them up in the Structure...with Your Current Transformers

SIMPLIFY CONNECTIONS—Their light weight and small size enable you to mount them in the structure—thus simplifying primary (high-voltage) connections.

SAVE SPACE—Mounting in the structure saves valuable ground space.

SAVE FOUNDATION EXPENSE—When you put them up in the structure you don't need to construct a separate foundation.

HANDLE THEM EASIER—Their reduced size and weight make them easier to install.

REDUCE MAINTENANCE—Forget about testing or inspecting the insulating liquid; it's hermetically sealed in—there are no gaskets.

Here's How They're Built

ACCURACY—These transformers meet the highest accuracy classification—¼W, ¼X, ¼Y, ¼Z—and they're suitable for both metering and relaying.

INSULATION—Ample insulation is provided to meet the ASA standards on both impulse and low-frequency tests.

BUSHINGS—Sealed bushings eliminate gasketed joints.

TANK AND COVER—Steel plate is used, and the tank is hermetically sealed by welding the cover to it—again, no gaskets.

CORE—The core is rectangular in shape, and is similar to the *Spirakore design used in G-E distribution transformers.

***PYRANOL OR OIL-FILLED**—For the best protection to your system, you'll want to specify Pyranol—General Electric's non-inflammable cooling and insulating liquid. It has high dielectric strength and is chemically stable.

*Reg. U. S. Pat. Off.

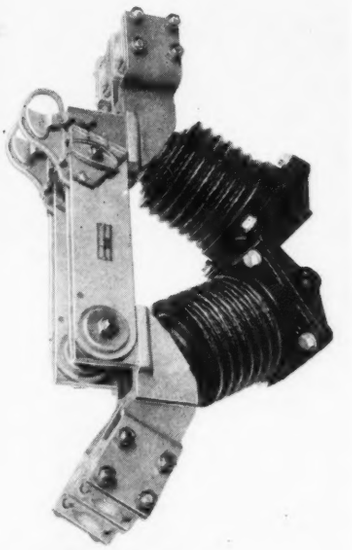
The Army-Navy "E", for Excellence in the manufacture of war equipment, now flies over six G-E plants employing 100,000 men and women.

GENERAL ELECTRIC

604-11-6400

Disconnect Switch (609)

Delta-Star Electric Co. has announced a heavy duty 3,000-amp. 23-kv. disconnecting switch arranged for angle iron mounting. The terminal arrangement permits taking off cables to the front, rear or top, as desired, eliminating back connected bushings and studs, the manufacturer states. The blades have a pressure releasing device to insure easy opening, it is reported, and the high pressure contacts are of the silver-to-copper type.



Tree Insulator (610)

An all-porcelain tree insulator has been developed by the Porcelain Insulator Corp. as a substitute for wood wire protectors or those using critical materials. It is claimed to have an extremely hard and smooth surface to take care of abrasive action and is available 12, 14, or 16 in. long.

The insulator is hung on the wire at the point of contact with tree or limb and the tie wires are threaded through the two holes at each end of the insulator and are twisted about the service wire.

Frequency Meter (611)

Hewlett-Packard Co. has announced its Model 500A frequency meter designed to measure the frequency of an alternating voltage from 0 to 50 kc. According to the manufacturer, this unit is particularly suited to crystal grinding work, where it can be used to measure the frequency deviation from the standard quickly and accurately. It is also stated that in frequency measurement work at higher frequencies it can be used to measure the frequency difference between two radio frequency signals.

Marine Fittings (612)

Spero Electric Corp. has added a line of 9S series metal enclosures and accessories manufactured according to Navy specifications. Basic 9S Navy boxes are available in 3, 4 and 5-in sizes, watertight or non-watertight, with the following devices: double-pole switches, three-pole switches, two-circuit switches, three-way switches, plug receptacles, push buttons, branch boxes and junction boxes.

To Help Workmen

GET THE MOST FROM TOOLS

IT takes tools—lots of them—to win a mechanized war. Every pair of pliers—every wrench—every hand tool that is broken on the home front is a break for Hitler.

To aid experienced electricians and mechanics to get the most out of tools—to help train green hands, too—Mathias Klein & Sons have prepared a pocket-size guide containing valuable information on the care of tools and suggestions for their safe use. This is a contribution we are making to aid fighters on our industrial front in securing the long life and satisfactory service that is built into the quality tools they use. Mail the coupon below for your copy.

ASK YOUR SUPPLIER

Foreign Distributors:
International Standard Electric Corporation, New York

Mathias Klein & Sons
3200 Belmont Avenue, Chicago, Illinois
Gentlemen: Please send me without charge a copy of the booklet *"Long Life to Tools."*

Name.....

Address.....

City.....*State*.....

KLEIN TOOLS

Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
3200 BELMONT AVENUE, CHICAGO

VARNISHED CAMBRIC . RUBBER POWER CABLES . BUILDING WIRE . RADIO WIRES . SIGNAL CABLES . FLEXIBLE CORDS . LEAD-ENCASED AND PARKWAY CABLES . ARMORED CABLES

CRESFLEX NON-METALLIC SHEATHED CABLE . SERVICE ENTRANCE CABLE . MAGNET WIRE . BARE WIRE

Some of the

CRESCENT

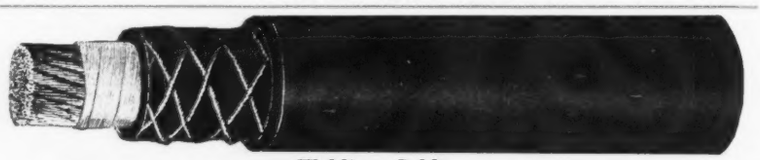
ELECTRICAL WIRES AND CABLES

That Are Meeting Today's Special Needs

For war housing, industrial wiring and interior wiring of all kinds.

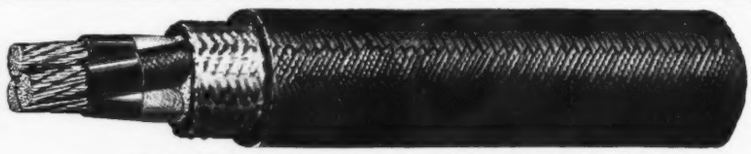
"CRESFLEX" Non-Metallic Sheathed Cable

Extensively used in shipyards, and for the manufacture of tanks, guns and planes.



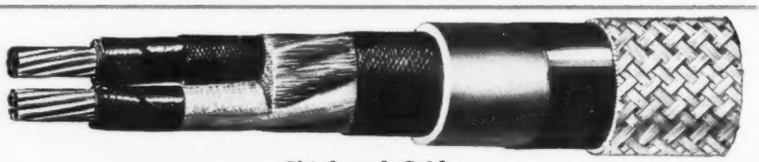
Welding Cable

For portable power leads to drills, tools, welding and construction machinery.



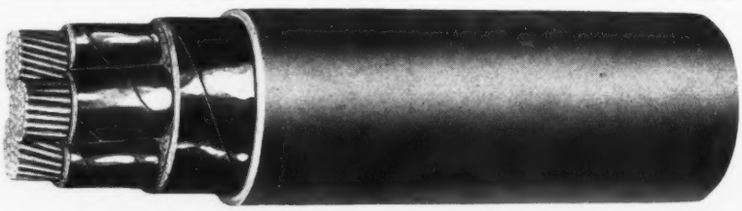
"PERMACORD" Heavy Duty Portable Cable

For electric power and control circuits aboard ship.



Shipboard Cable

For general industrial power wiring. Widely used because no rubber required in construction, and can carry larger currents for same size copper conductors.



Varnished Cambric Power Cable

CRESCENT INSULATED WIRE & CABLE CO.

CRESCENT
WIRE and CABLE

Factory: TRENTON, N. J.—*Stocks in Principal Cities*

LOS ANGELES
Tri-State Supply Corp.
544 S. San Pedro St.

SAN FRANCISCO
Tri-State Supply Corp.
554 Bryant St.

KANSAS CITY
W. F. Howe & Co.,
2627 McGee St.

CRESCENT ENDURITE SUPER-AGING INSULATION . WEATHER-PROOF WIRE

THE FUTURE WILL REFLECT THE PAST

AT 7:30 A. M. ON THE THIRD OF JANUARY, 1937, Southern Pacific Extra 4144 rounded Horseshoe Bend out of Sparks, Nevada. Plowing through the snow, it tugged 52 carloads of General Electric Refrigerators over the summit of the Sierra Nevadas.

General Electric Dealers well remember this occasion.

In days of peace, even greater merchandising opportunities will be offered to our appliance dealers. The future will reflect the past!

GENERAL ELECTRIC SUPPLY CORPORATION

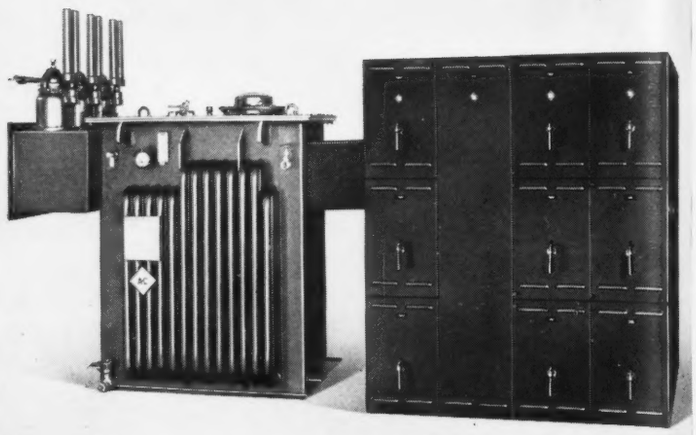
A national organization serving the West with 14 conveniently located Offices and Warehouses

SAN FRANCISCO, OAKLAND, SACRAMENTO, FRESNO, LOS ANGELES AND SAN DIEGO, CALIFORNIA

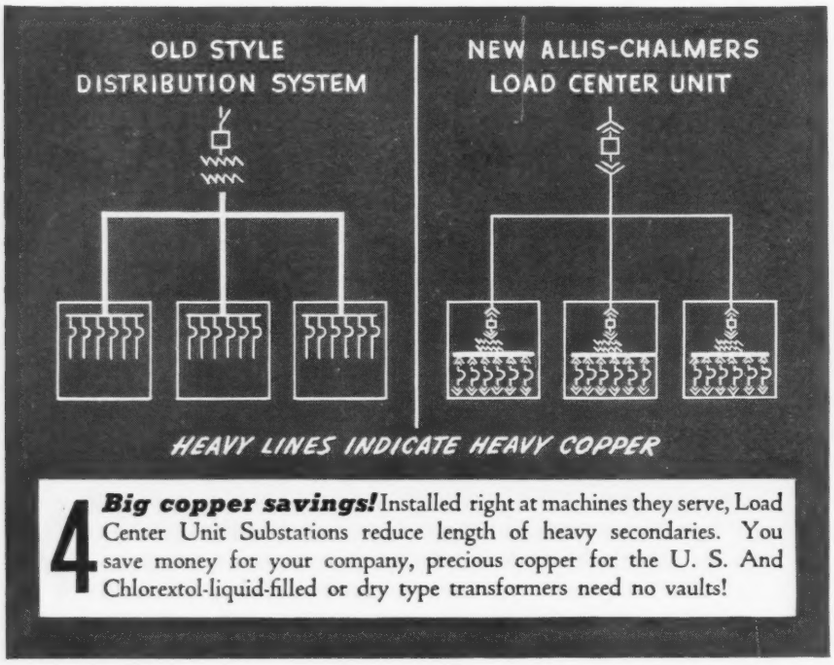
SEATTLE AND SPOKANE, WASHINGTON • PORTLAND, OREGON • PHOENIX, ARIZONA • SALT LAKE CITY, UTAH DENVER, COLORADO • BUTTE AND BILLINGS, MONTANA

Here's the Plus

Modern packaged design of great new Allis-Chalmers Standard Load Center Unit Substations gives you 6 important new wartime *and peacetime* advantages!



1 ***Faster deliveries!*** Standardized design of Allis-Chalmers Load Center Unit Substations eliminates "specials," saving time on drafting board and in shops. Yet these units are completely adaptable to your needs . . .



4 ***Big copper savings!*** Installed right at machines they serve, Load Center Unit Substations reduce length of heavy secondaries. You save money for your company, precious copper for the U. S. And Chlorextol-liquid-filled or dry type transformers need no vaults!

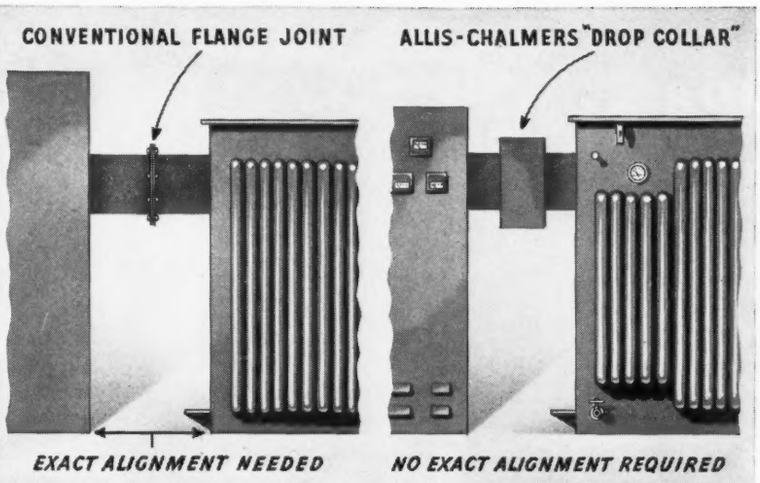
5 ***Better performance!*** Lower losses and improved regulation give you better motor and lamp performance.

ALLIS-CHALMERS

in Packaging!

HIGH SIDE	LOW SIDE
1. DISCONNECT SWITCHES	1. STATIONARY AIR BREAKERS
2. OIL FUSE CUTOUTS	2. DRAWOUT AIR BREAKERS
3. METAL-CLAD SWITCHGEAR	(CAN BE ELECTRICALLY OR MANUALLY OPERATED)
4. DIRECT CONNECTION TO ROOF BUSHINGS	
5. THROAT CONNECTION TO BUS RUN	

2 ***Flexibility!*** Note wide variety of high and low voltage equipment. Transformers are oil or Chlorextol-liquid-filled or dry type.



3 ***Easier installation!*** Allis-Chalmers "drop collar" on outdoor units and on high side of indoor units means no flanges to bolt, no need for exact alignment at base. Flexible cable low-voltage connection on indoor units also saves time.

6 ***Saving in space!*** Compactly designed, an Allis-Chalmers outdoor Unit Substation fits into the *corner* of a conventional substation! If load center shifts, these packaged units are easier to move. And that trim *appearance* is an asset!

It All Adds Up to Smart Buying!

WHEN YOU specify Allis-Chalmers Standard Load Center Unit Substations, you specify faster deliveries, great flexibility, big savings for your company in both installation time and space!

That's smart buying—and patriotic buying, too. These new units help you contribute important copper saving to the war effort!

Get the *full* story on Load Center Unit Substations from the district office near you. ALLIS-CHALMERS MFG. CO., MILWAUKEE, WIS.

A 1587

UNIT SUBSTATIONS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

Education of an ELECTRON...

MORE THAN MEN are being made in this war. "Gadgets" too are finding themselves, learning for the first time some of their own vast potentialities, *getting educated* . . .

Take electron tubes. Right now they're doing a dozen jobs peacetime progress would never have demanded of them—spotting enemy planes, aiming guns, dropping bombs . . .

Like the fighting men whose untiring comrades-in-arms they are, electron tubes are coming home with Victory. They'll be looking for jobs too—jobs to fit the skills they've learned at war!

Then it's going to be up to Yankee ingenuity to put these war graduates to work — heating homes, cooking meals, molding plastics, daylighting factories, melting and treating metals . . .

Yankee ingenuity *will* put them to work —for a better world. And Roebling is working today to that same end. Making the wires and cables—like Paper-Insulated Power Cable, Armored Parkway Cable, Roevar Magnet Wire—that are helping Electronics right now to win this war.

JOHN A. ROEBLING'S SONS COMPANY OF CALIFORNIA

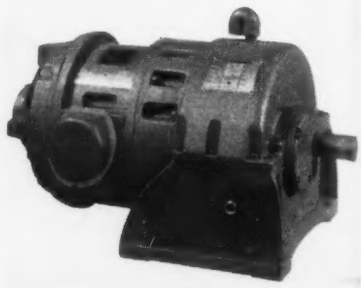
San Francisco • Los Angeles • Seattle • Portland

ROEBLING

ELECTRICAL WIRES AND CABLES

Gearmotors (613)

Westinghouse Electric & Mfg. Co. has designed a line of horizontal parallel shaft type gearmotors to meet speed reduction requirements of industrial applications over a range of 1 to 75 hp. Use of adaptor castings between motor and mechanical parts allows the use of all standard Westinghouse NEMA frame motors with each type of unit and types of motor construction can be changed



to suit varying service conditions in the field, the manufacturer states.

Gears and pinions are of .40-.50 carbon steel and are given special heat treatment before hobbing, according to the announcement. Each unit is said to conform to AGMA standard output speeds and application practices.

Frequency Meter (614)

J-B-T Instruments, Inc. has designed a vibrating reed frequency meter which it claims has no delicate pointers, pivots or jewels. According to the manufacturer, the alternating-current excites the driving coil and since each reed is adjusted to respond by resonance to but one frequency, the one reed "in tune" with the frequency in the coils will respond by vibrating rapidly because of polarization by the permanent magnet and inducted magnetism from the coil. A series resistor adapts the instrument to specified operating voltage.

The manufacturer states that no mechanical adjustment is necessary in service since sensitivity is present during manufacture, and that reading is made easier by full reed amplitude and special reed grouping in many models.

A-C Arc Welders (615)

Harnischfeger Corp. has added a line of industrial a-c arc welders. These machines are available in seven heavy-duty and four intermittent-duty models with a range of capacities for handling production welding under continuous operation, the manufacturer announces. The new line features the recently adopted Welding Service Range ratings showing the actual minimum to maximum output of usable welding current, it is stated.

Resistance Welders (616)

Progressive Welder Co. has announced a line of press or projection-type resistance welders available in light, medium, heavy and extra-heavy-duty models and in from 4 to 6 kva. capacities and a variety of throat depths. Each model is available either in air-operated or motor-driven style and extra heavy models are also furnished with hydraulic operation.

CHECK the FACTS

1. HI-PRESSURE, self-cleaning contact, one piece jaw and terminal.
2. Simple, rugged, efficient blade operating parts.
3. Weatherproof greaseless bearing for easy operation.

The Check list

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES
INDOOR AND OUTDOOR

AIR BREAK SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES

IRK INTERLOCK SYSTEMS

AUTOMATIC SECTIONALIZING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

R&IE

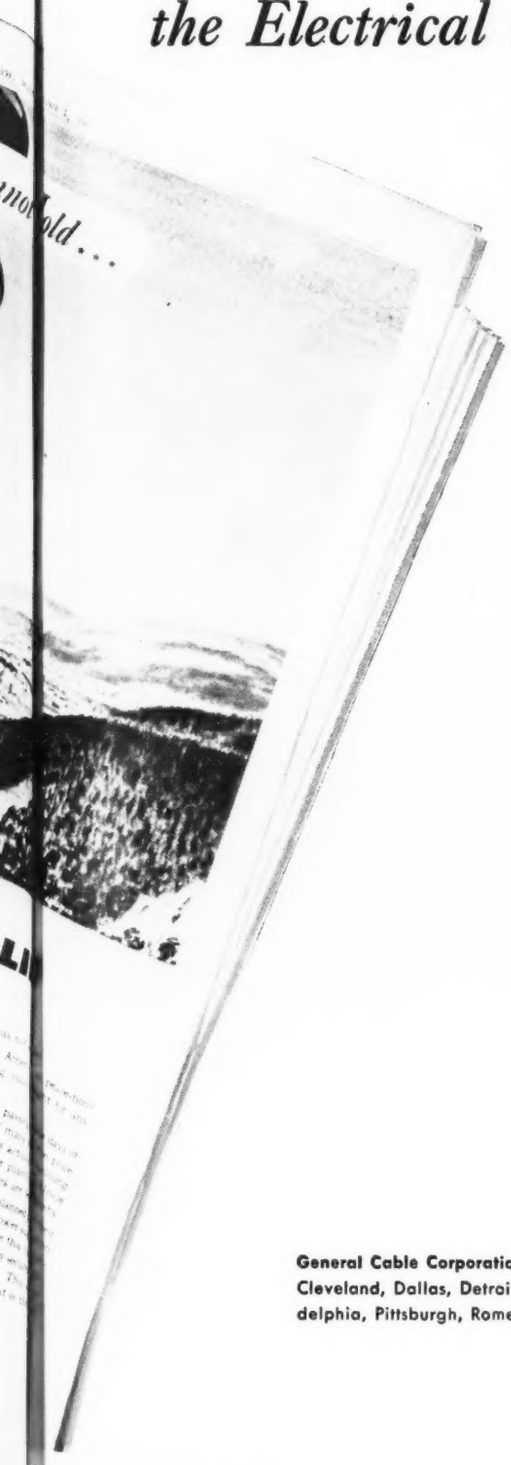
Type **TTR-** DISCONNECTING SWITCH

RAILWAY AND INDUSTRIAL ENGINEERING CO., GREENSBURG, PA.

IN CANADA—EASTERN POWER DEVICES, LIMITED, TORONTO

This advertisement appears in the June 2 issues of the New York Herald-Tribune, Chicago News, St. Louis Post Dispatch, San Francisco Chronicle, Washington Times-Herald, Philadelphia Inquirer, Los Angeles Examiner, Dallas News, Boston Herald Traveler, Cleveland Press, Detroit News, Portland Oregonian, Buffalo News, Pittsburgh Press and in the June 19 issue of Business Week.

If General Cable can arouse public opinion to a fuller appreciation of the Electrical Industry's War-time Contribution to the national welfare, it will have realized its hope to have rendered a constructive service.



GENERAL CABLE

General Cable Corporation Sales Offices: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Kansas City (Mo.), Los Angeles, New York, Philadelphia, Pittsburgh, Rome (N.Y.), St. Louis, San Francisco, Seattle, Washington (D.C.)

OUTSTANDING PRODUCTION ACHIEVEMENT

In recognition of the way in which Simplex has responded to the demands of the shipbuilding program, the U. S. Maritime Commission recently awarded to us the Maritime "M" Pennant and the Victory Fleet Flag for outstanding production achievement.

SIMPLEX SHIPBOARD CABLES FOR VICTORY SHIPS.....

With the rapidly expanding shipbuilding program there has been a corresponding increase in requirements for power and communication cables without which the ships cannot be operated. Production has been stepped up to meet the increased demand and Simplex shipboard cables are being supplied in steadily increasing volume.

They are in service in all parts of the world where supplies are being sent to our allies or to our own military forces overseas. They are helping to maintain the "bridge of ships" that is a vital part of the military equipment of the United Nations.

Simplex cables for all types of service conform to government restrictions and regulations controlling the use of copper, rubber and other scarce materials but they may be depended upon for satisfactory performance. If you must have cables for essential, high priority war work, we shall be pleased to tell you what Simplex cables can do for you.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

ARMY E NAVY

Simplex WIRES and CABLES

PACIFIC COAST OFFICES

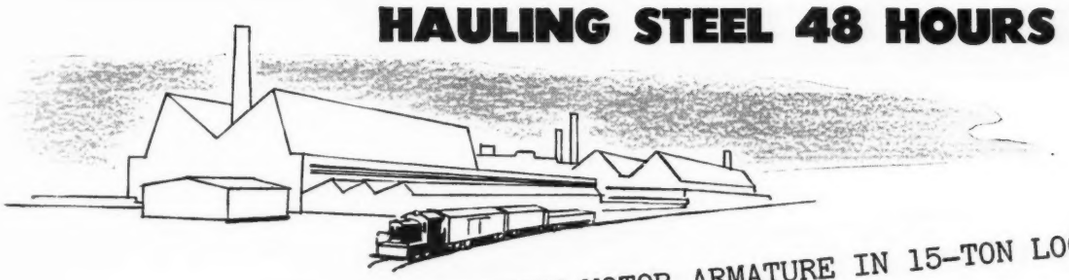
390 Fourth St., San Francisco, Calif.

910 East Third St., Los Angeles, Calif.

503 Polson Bldg., Seattle, Wash.

sidetracked AT NOON

HAULING STEEL 48 HOURS LATER



STEEL HAULING STOPPED WHEN MOTOR ARMATURE IN 15-TON LOCO-MOTIVE FAILED. ARMATURE DELIVERED TO WESTINGHOUSE DISTRICT MANUFACTURING AND REPAIR PLANT SAME EVENING. COMMUTATOR WAS DISMANTLED, V-RING MACHINED AND REBUILT. BARS CUT BACK AND NEW V'S MACHINED. MOTOR ASSEMBLED AND BACK IN LOCOMO-TIVE—HAULING STEEL 48 HRS. LATER.

Westinghouse

DISTRICT MANUFACTURING AND REPAIR

J-90465

***IF* THE EQUIPMENT NEEDING REPAIR IS VITAL TO THE WAR EFFORT . . . PHONE THE NEAREST OFFICE OF WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY FOR**

EMERGENCY SERVICE

33 M & R PLANTS . . . ONE NEAR YOU!

SIGHT
PRIVATE

G-E MAZDA LAMPS

LIGHTING MEN have long realized their responsibility to America at war. They have helped to add countless man hours to factory production through improved seeing conditions.

Fully aware of the effect of lighting on production, safety, spoilage, health and morale . . .

Fully aware of the fact that lighting equipment uses critical material . . .

And fully aware of the ways and means of getting the most out of present lighting equipment . . . these men are working with their war-plant customers to help them in every way possible.

Among the things they are recommending and helping their customers to do are:

—Cleaning bulbs and reflectors on a regular schedule.

—Cleaning walls and ceilings—paint if necessary—to reflect all possible light on to the working plane.

—The proper placement of fixtures so that shadows on the work are eliminated.
—Shading of bare bulbs to cut glare to a minimum.

—All of those things that improve seeing conditions with a minimum use of critical materials.

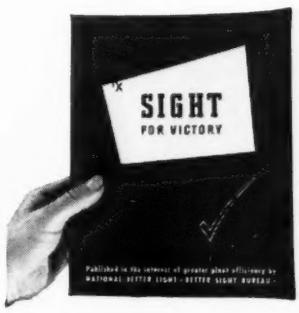
Some people call it conservation. Others call it making the most of what we have. Another name for it is just plain Yankee ingenuity. Whatever you call it, it's the way the Lighting Man is discharging his responsibility to America at war.

"SIGHT FOR VICTORY" This month the whole lighting industry is cooperating in an effort to help all war plants—large and small—do these things:

1. Check their seeing conditions.

2. Get the most out of present lighting equipment.

A booklet, "Sight for Victory" and a time-saving light-sight check sheet has been prepared by the National Better Light-Better Sight Bureau. If you haven't heard about it, write for further information to National Better Light-Better Sight Bureau, 420 Lexington Avenue, New York, N. Y.



GENERAL ELECTRIC

Thousands of Kuhlman Transformers have proven their ability to stand up on the job •

There isn't a state in the union in which Kuhlman Transformers are not on the job—distributing power 24 hours a day, in all kinds of climates, in all kinds of weather 365 days a year. Kuhlman Transformers have proven over a period of forty-seven years that they have what it takes to stand up on the job. The Kuhlman B. I. (Bent Iron) core results in lower exciting currents, reduced weight and better all-around operating characteristics. The copper bearing steel tanks effectively resist the havoc of rust and corrosion. The pockets for primary and secondary bushings, pressed into the tank, protect the bushing seats from the weather. And both primary and secondary bushings are sturdily constructed to prevent breakage.

In fact, each component part of a Kuhlman Distribution Transformer is designed and built to take more punishment than it will ever be subjected to in actual service.

In addition to Standard Distribution and Power Transformers, Kuhlman builds a complete line of C.S.P., Saf-T-Kuhl and Dry-type Transformers and Line Regulators. Write today for complete facts about any or all of these Kuhlman products.

Kuhlman

ELECTRIC COMPANY
BAY CITY, MICHIGAN

New FRIGIDAIRE campaign an outstanding success

More than 4 million FRIGIDAIRE booklets requested in less than 3 months!

Frigidaire's plan was announced just a short time ago! The third campaign advertisement has just reached the newsstands! Yet even at this early date Frigidaire's new program has created widespread interest and enthusiasm.

Frigidaire dealers hail the campaign as an exceptional good will builder. They are carrying out extensive promotions in their communities to get full benefit from the powerful appeal of Frigidaire's WARTIME SUGGESTIONS booklet. They are using it to maintain their identification with the Frigidaire business, and to build good will that will be increasingly valuable to them as time goes on!

How dealers build good will with WARTIME SUGGESTIONS

Quick to seize an opportunity, Frigidaire dealers are tying in with Frigidaire's national advertising, and are providing refrigerator users with WARTIME SUGGESTIONS booklets in many resourceful ways:

- X Giving to store visitors
- X Mailing to Frigidaire users
- X Leaving on service calls
- X Mailing to store customers
- X Giving to Home Economics classes
- X Giving to Red Cross or other groups
- X Offering in advertising
- X Distributing in cooking schools
- X Distributing through County Home Demonstration Agents
- X Offering in window displays

Every day brings thousands of requests for WARTIME SUGGESTIONS booklets from refrigerator users everywhere. Many request specific information. Others tell how proud they are of their Frigidaires and how interested they are in receiving help on today's food and refrigeration problems.

COMING! "Care of the refrigerator" is the next timely message that will appear during May and June in Life, Ladies' Home Journal, Woman's Home Companion, Good Housekeeping, McCall's, Better Homes & Gardens, American Home, True Story and Farm Journal and Farmer's Wife, with a combined circulation of more than 27 million copies. Watch for it!

For Excellence ARMY E NAVY *in War Production*

FRIGIDAIRE Division of GENERAL MOTORS

Peacetime Builders of Home Appliances, Commercial Refrigeration, Air Conditioners

WRITE YOUR OWN TICKET *for*

UPTEGRAFF TRANSFORMERS

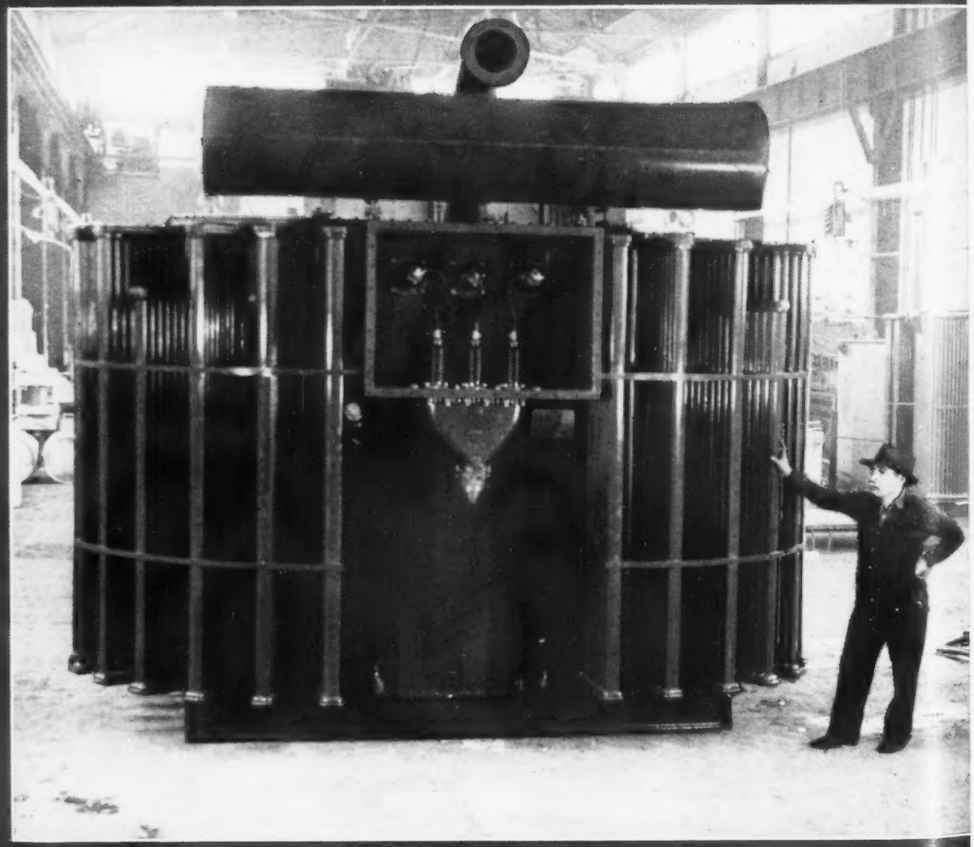
TICKET

DELIVERY DATE _____

SPECIFICATIONS _____

Watch us make it— or Better it!

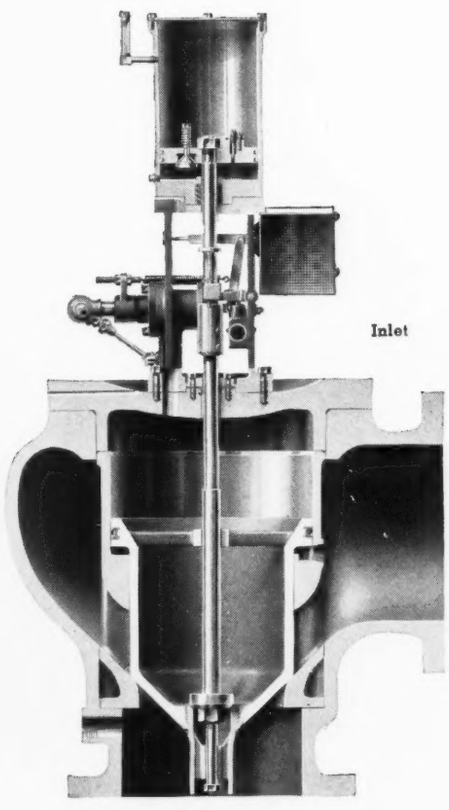
WE ARE MANNED AND EQUIPPED IN ENGINEERS AND SHOP TO GET YOUR TRANSFORMERS TO YOU "AS YOU WANT THEM, WHEN YOU WANT THEM." TELL US YOUR NEEDS.



R. E. UPTEGRAFF *Manufacturing Co.*

SCOTTDALE PENN'A · U·S·A·

To Engineers whose
Water-Pumping Lines MIGHT BURST from Back Surges—



Assure Protection with the
PELTON
SURGE SUPPRESSOR

Supplying a reliable water service calls for protection against *line breaks* should the pumping power go off and dangerous back surges burst the line.

The Pelton Surge Suppressor, located near the pump, opens automatically before the back surge arrives and releases the water.

It also opens automatically if excess pressure develops from causes other than pumping-power failure.

After releasing the water and clearing the line of dangerous surges, the Pelton Surge Suppressor automatically closes.

THE PELTON WATER WHEEL COMPANY
Hydraulic Engineers
2929 NINETEENTH ST., SAN FRANCISCO

EXCLUSIVE WESTERN REPRESENTATIVES for Baldwin-Southwark Division of Baldwin Locomotive Works, Baldwin-De La Vergne Sales Corp., Woodward Governor Co. and Cone Valve Division, Chapman Valve Mfg. Co.

120 Broadway NEW YORK

Paschall Station PHILADELPHIA

THE BALDWIN GROUP

PELTON

Subsidiary of THE BALDWIN LOCOMOTIVE WORKS

TO HIT 'EM H-A-R-D-E-R

THE year 1943 promises to be the grimmest, hardest year this country has ever faced. Every effort, and every dollar of national income not absolutely needed for existence, should go into war work and War Bonds.

In the Pay Roll Savings Plan, America finds a potent weapon for the winning of the war—and one of the soundest guarantees of the preservation of the American way of life!

Today about 30,000,000 wage earners, in 175,000 plants, are buying War Bonds at the rate of nearly half a billion dollars a month. *Great as this sum is, it is not enough!* For the more dollars made available now, the fewer the lives laid down on the bloody roads to Berlin and Tokio!

You've undoubtedly got a Pay Roll Savings Plan in your own plant. But how long is it since you last checked up on its progress? *If it now shows only about 10% of the gross payroll going into War Bonds, it needs jacking up!*

This is a *continuing* effort—and it needs *continual* attention and *continual* stimulation to get fullest results.

You can well afford to give this matter your close personal attention! The actual case histories of thousands of plants prove that the successful working out of a Pay Roll Savings Plan gives labor and management a common interest that almost inevitably results in better mutual understanding and better labor relations.

Minor misunderstandings and wage disputes become fewer. Production usually increases, and company spirit soars. And it goes without saying that workers with substantial savings are usually far more satisfied and more dependable.

And one thing more, these War Bonds are not only going to help win the war, they are also going to do much to close the dangerous inflationary gap, and help prevent post-war depression. The time and effort *you* now put in in selling War Bonds and teaching your workers to save, rather than to spend, will be richly repaid many times over—now and when the war is won.

You've done your bit. Now do your best!

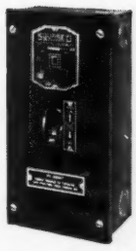
This space is a contribution to victory today and sound business tomorrow by ELECTRICAL WEST

Circuit Breakers

FOR EVERY TYPE OF INDUSTRIAL APPLICATION

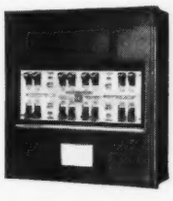
Rain-tight Multi-breakers with a variety of circuit arrangements for such outdoor applications as lights, signs, etc. Also Multi-breakers and circuit breakers in weather and dust-tight and explosion-resisting enclosures.

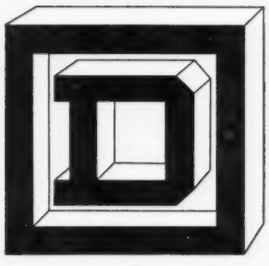
Industrial Circuit Breakers in standard sheet steel enclosures are available in capacities from 15 amperes to 600 amperes, up to 575 Volts. Made in 2 and 3 poles and for 3 and 4-wire systems. These devices are quick make and quick break with trip indication.



General Purpose Circuit Breakers are made with 1, 2, and 3 poles for 230 Volts A.C. and 125/250 Volts D.C. Common trip. Available in sheet steel enclosures as well as weatherproof, dust-tight and explosion-resisting enclosures. 15 to 50 amperes.

Multi-breaker Load Centers for controlling and protecting lighting and small power circuits. Made in a variety of circuit arrangements with capacities of 15, 20, 25, 35 and 50 amperes, for either 2 or 3-wire service, with individual trip.





MO Multi-breaker for use on small machines such as drill presses, grinders, riveters, staplers, saws, beaters, etc. Available in single and double pole or for 2 and 3-wire systems. 15, 20 and 25 amperes. Price is comparable to Type D switches.

Industrial Multi-breakers are available in capacities from 15 to 100 amperes, with 2 or 3 poles. Quick make, quick break with dust-resisting sheet steel enclosures; also, explosion-resisting types. Front operated with trip indication.

Weatherproof, Dust-tight and Explosion-Resisting Circuit Breakers are furnished in cast iron enclosures with gray enamel finish. Standard conduit openings in the ends. Capacities—15 to 600 amperes up to 575 Volts.

SQUARE D circuit breakers provide quick restoration of service after short circuits or overloads. They eliminate fuses and reduce maintenance cost since no replacement of parts is necessary.

Built into every Square D circuit breaker is a time lag feature which permits harmless momentary overloads to pass without causing the unit to disconnect the circuit.

Square D's line of circuit breakers is unusually complete, assuring the right unit for any given installation.

CALL IN A SQUARE D FIELD ENGINEER

If you have a problem which involves electrical control or distribution, you're welcome to the counsel of the nearest Square D Field Engineer. He is in constant contact with plants of every kind and size. He studies methods and applications with the idea of simplifying new jobs or doing old ones better.

There are Field Engineers in Square D branch offices in 52 principal United States and Canadian cities. Their services are dedicated to solving industry's war and postwar electrical problems.

SQUARE D COMPANY

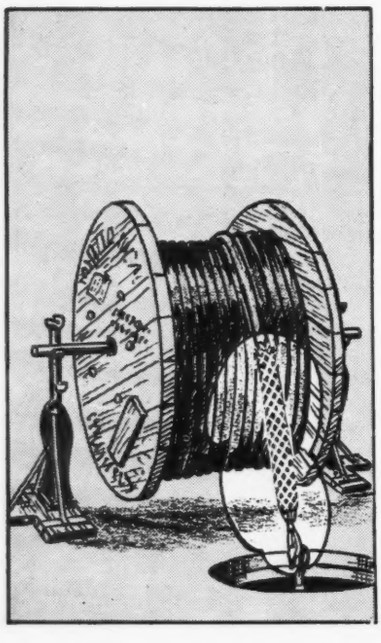
LOS ANGELES - DETROIT - MILWAUKEE

KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

SPEED

CONSTRUCTION and EXPANSION of PLANT FACILITIES



RELIABLE CABLE GRIPS

For Pulling in Wires and Cable

These grips can be installed quickly and pull cables dependably. They do not let go halfway through a duct because wires pull with evenly distributed load. Eight different styles—all supplied in a full range of sizes.

Reliable
ELECTRIC COMPANY
OVER 30 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE · CHICAGO ILLINOIS

BULLETINS

data books, etc.

Synthetic Rubber (617)

A 40-page booklet, "The Five Commercial Types of Synthetic Rubber" has been released by the United States Rubber Co. This booklet, which was compiled for the company's sales engineers, traces the development of synthetic rubber, describes the properties of commercial synthetic types, and tells the part played by the company in their development and manufacture.

Included are photographs of manufacture, diagrams, and a chart giving the relative physical and chemical properties of natural rubber and of the five types of synthetic rubber.

Fire Extinguishers (618)

Charts giving data on the use of all types of fire extinguishers have been issued by American - LaFrance - Foamite Corp. These charts tabulate the several types of hand fire extinguishers and wheeled engines and their suitability or otherwise as applying to Class A, B and C fires, in accordance with Underwriters' Laboratories classification. A Class D is added to cover automobiles, commercial trucks, etc. and a Class DT to cover tank-trucks and trailer-tractors. Data is given as to methods of operation, capacity, range of stream.

Temperature Instruments (619)

Micromax temperature instruments for steam plants are described in a 36-page catalogue prepared by Leeds & Northrup Co. Recorders for use with thermocouples or with thermohm resistance thermometer bulbs are listed. Applications to temperature measurement of steam, feed water and cooling water, and to fuel, combustion air and flue gas, are given.

Electric Gages (620)

General Electric Co. has issued a reprint of an article on electric gages by H. P. Kuehni, of the company's engineering laboratory. The article, which appeared originally in the G-E Review, describes the functions of 21 electric gages and contains a chart showing schematic representations of electric gage circuit applications.

Included among the gages described and illustrated are thickness, magnetic, electrolimit, pressure, strain and eccentricity gages.

Wartime Catalogue Sheets (621)

Anticipating government-enforced standardization, the Solar Capacitor Sales Corp. has issued catalogue sheets listing types which it recommends as being most readily available and designed for a maximum number of applications. Folder V-1 is for civilian radio maintenance and V-2 is for government and industrial electronic applications.

Pump Maintenance (622)

An owner's manual on wartime care and maintenance of electric farm pumps and water systems has been prepared by the Electric Water Systems Council and will be distributed through dealers. This 16-page booklet gives hints on home service and repair of minor troubles, and advises a call to the dealer when in doubt.

Steel Grating (623)

Blaw-Knox Co. tells about its electroforged steel grating and treads in a 24-page catalogue. Various applications are illustrated and a table of safe loads is included.

Brazing (624)

Westinghouse Electric & Mfg. Co. describes brazing with Phos-Copper alloy in a 12-page booklet recently released. Hints on good brazing are included, and various types of joints are discussed. Illustrated by photographs and diagrams.

Cable Terminators (625)

Delta-Star Electric Co. has published a folder of data on its "PB" indoor cable terminators for voltages up to and including 2,300 volts. This unit is a cable end sealing device with either mechanical, stuffing box or wiping sleeve entrance. Construction data and dimensions are given.

Pre-Plated Metals (626)

A data sheet on its pre-plated metals has been prepared by the Apollo Metal Works.

ELECTRICAL WEST, 68 Post St., San Francisco, California

Please send me information about following CIRCLED items:

600	601	602	603	604	605	606	607	608	609
610	611	612	613	614	615	616	617	618	619
620	621	622	623	624	625	626			

Name..... Company*..... Title*.....

Address.....

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

AIR is LIFE to a sub crew... but DEATH to unstable turbine oils!

WHEN oxidation attacks, unstable oils can't last long. That's why turbine operators are switching to the new Shell Turbo Oil. There's not another turbine oil today that can match its ability to resist oxidation.

For positive proof, check the 19,851 hrs. performance record of the Norton Co., abrasive manufacturers, shown below. It is but one of the scores of examples that prove Shell Turbo Oil not only has superior oxidation stability—it also prevents rust!

For further details on this and other outstanding performances of Shell Turbo Oil call in the Shell man. Or, write Shell Oil Company, Inc., Dept. "B", 50 W. 50th St., New York, N. Y., or 100 Bush St., San Francisco, Cal.

SHELL TURBO OIL

Currently, the U. S. Navy has first call on Shell's entire production of marine turbine oil

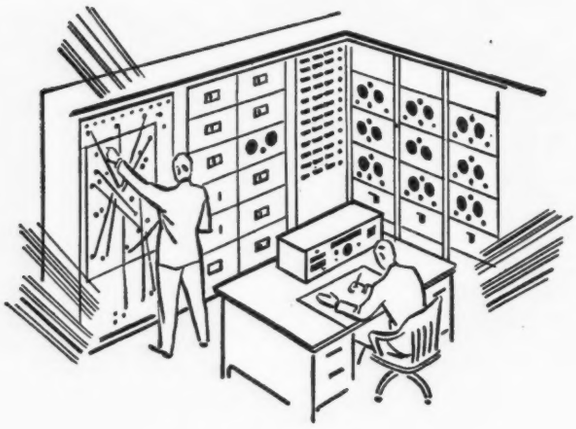
SHELL

Certified Proof of the Superior OXIDATION STABILITY of Shell Turbo Oil

156	CHARACTERISTICS	157
Clear	Viscosity @ 100° F.	Clear
LT .05	Appearance	.02
LT .2	Neutralization No.	.2
90	Saponification No.	90
	Steam Emulsion No.	

Performance record of Shell Turbo Oil in 2500 kw. unit of the Norton Co., Worcester, Mass.

MORE KILOWATTHOURS FOR VICTORY



LINE CONSTRUCTION ELIMINATED

...through calculator study

Operating conditions had to be improved on a 66 kv ordnance plant line, or a mid-western utility serving the plant would have to build a new line. With critical materials and time restricted, new line construction was to be avoided.

The ordnance line was one of a network of 66 kv circuits that tied together all terminals of a 138 kv interconnecting line. Faults on the 138 kv lines caused system instability—a condition that could not be permitted to exist.

A system study with the Westinghouse network calculator quickly revealed that this line could be stabilized by the use of modern high-speed relays. High-speed fault isolation, while permitting stability to be maintained, left the remaining 66 kv tie lines severely overloaded and resulted in impossible regulation at intermediate load points.

Further studies showed that by applying 30 cycle, gang-operated reclosing to the present 138 kv breakers, the system would be stabilized and operate satisfactorily through all types of faults.

This case indicates how the use of modern relay equipment and the application of reclosing to existing breakers can be employed to eliminate additional line construction. Similar Westinghouse analysis and engineering may help to solve some of your problems. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

J-97070

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Power Without Ration Stamps

In 1915, a transmission link established between two utility members of the Northwest Electric Light & Power Association marked the beginning in this region of a program of system interconnections and economic power interchange. Long an important factor in the development of low-cost electric service in the area, these system interconnections now play a vital part in supplying the Northwest's wartime demands for energy.

Since 1908, this Association has been a medium for exchange of information and ideas for the working out of common problems—a contributor to the progress of the industry.

NORTHWEST ELECTRIC LIGHT POWER ASSOCIATION

418 SPALDING BUILDING **PORTLAND, OREGON**

San Diego's **BUREAU OF RADIO & ELECTRICAL APPLIANCES** in cooperation with the **SAN DIEGO GAS & ELECTRIC COMPANY** is running a series of timely advertisements using Americanism as an important theme. The advertisement reproduced here reminds readers that San Diego's annual Spring Fair of Home Appliances will not be held this year but suggests care of appliances and offers a promise of post-war production.

SAN DIEGO'S TENTH ANNUAL
Spring Fair
WILL NOT BE HELD THIS YEAR!
YES, San Diego's big Annual Spring Fair with its gorgeous decorations, free entertainment and marvelous displays of the very latest developments in Electrical Appliances is OUT for the duration.
Eager throngs cannot crowd the great exhibition building and watch demonstrations of those things which go to make up the American Way of Life. Nor can they exercise their right of selection of products which free enterprise has made possible through streamline production.
But, the Spring Fair has not gone forever. It will come again --in the meantime--
Start Spring Offensive
TO SAVE WHAT YOU HAVE!
No, we cannot hold our Spring Fair in Balboa Park this year to show you what's new in Electrical Appliances because those same great organizations which have heretofore consistently improved their products are now wholeheartedly in war production.
But we CAN start a Spring Offensive here at home to preserve our high standards of living through the care of those appliances which we still have. And because new appliances are no longer being made and the repair problem is getting tougher and tougher, we suggest you consult your "War Timely Guide to the Use, Care and Repair of Home Appliances". You'll find the information both practical and easy to understand.
Get a "WAR TIMELY GUIDE". It's FREE!
San Diego distribution of the "War Timely Guide" was made through the Women's Block Plan (OCD). If you did not receive a copy, get one from your nearest appliance store or from any office of the SAN DIEGO GAS & ELECTRIC COMPANY.
For Suggestions on the Use, Care and Repair of Refrigerators See Page 8 WAR-TIMELY GUIDE
For Suggestions on the Use, Care and Repair of Radios See Page 10 WAR-TIMELY GUIDE
For Suggestions on the Use, Care and Repair of Irons See Page 25 WAR-TIMELY GUIDE
For Suggestions on the Use, Care and Repair of Electric Washers See Page 13 WAR-TIMELY GUIDE
For Suggestions on the Use, Care and Repair of Toasters See Page 21 WAR-TIMELY GUIDE
For Suggestions on the Use, Care and Repair of Roasters See Page 31 WAR-TIMELY GUIDE
Bureau of Radio and Electrical Appliances of San Diego County
Buy War Bonds and Stamps for the better things of Tomorrow

BUY WAR BONDS *Today* FOR THE BETTER THINGS OF *Tomorrow . . .*

For Continuing Achievement

A STAR FOR WESTON

—evidence that the vital instrument situation rests in good hands!

A star now adorns the ARMY-NAVY "E" pennant awarded to WESTON just 6 months ago . . . the first such pennant awarded in this highly specialized instrument field.

It's a star that has *real meaning*. Because, from the very beginning of our defense period, the responsibility for producing the vast quantities of instruments vital to the success of our country's efforts, has rested largely on the instrument leader.

This star signifies that the responsibility *rests in good hands*. "The men and women of the WESTON Electrical Instrument Corporation," writes the Chairman of the Navy Board for Production Awards, "have achieved a signal honor by continuing their splendid production in such volume as to justify this award . . . indicating their solid determination and ability to support our fighting forces with equipment necessary for victory."

But a great instrument task still remains . . . before victory is ours. So WESTON workers continue reaching for new goals . . . with the same determination, the same painstaking devotion to the quality ideal, responsible for WESTON'S *continuing leadership* in the instrument field.

WESTON ELECTRICAL INSTRUMENT CORPORATION, NEWARK, NEW JERSEY

WESTERN REPRESENTATIVES

Seattle, Wash.
Eicher & Bratt
263 Colman Bldg.

San Francisco, Calif.
Herman E. Held,
420 Market St.

Los Angeles, Calif.
Edward S. Sievers,
417 So. Hill St.

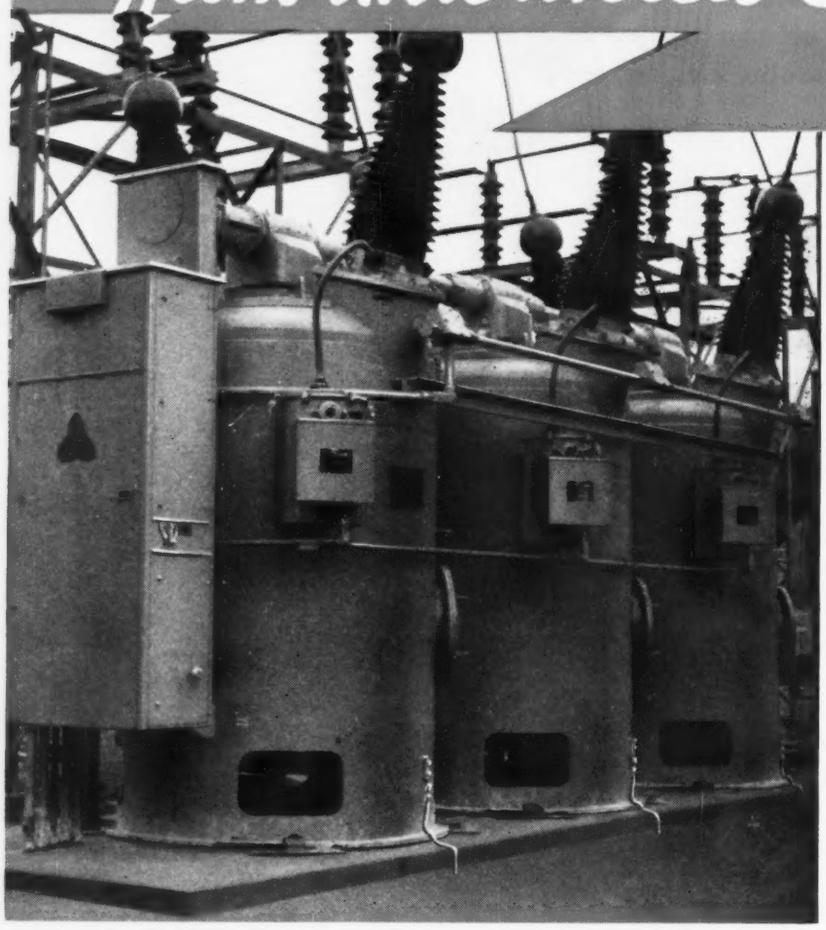
Denver, Colo.
Howard Peterson,
1921 Blake St.

Phoenix, Ariz.
J. E. Redmond Co.,
448 W. Madison St.

Protection from Unwanted Blackouts

with

PACIFIC ELECTRIC BREAKERS



Reliable, Trouble-Free—Assured by 37 Years of Specialized Manufacturing

Type RWE, 115 to 287kv.

Production today demands full protection from outages.

Here are reliable, trouble-free breakers needing the minimum of upkeep.

Made by the Pacific Electric Mfg. Corporation, you benefit from their 37 years of specialization in high-voltage switching equipment of *proved* design. There are 6 breaks per pole, with Expulsion Chambers which extinguish arcs quickly and thereby save contacts, save oil deterioration, reduce tank pressures and assure longer carefree protection.

These breakers offer fast opening, reclosing and perfect synchronizing at a reliable constant operating speed from our Motor-Wound Spring-Actuated Motor Control.

All of this has proved true at scores of Pacific Electric Breaker installations throughout the nation.

You get great mechanical strength and perfect alignment . . . accurate blade motion from the Bevel-Link Drive. Ask for all the details which assure full protection from unwanted blackouts.

Closes on AC Current without Rectifiers—Small Operating Power Needed—Fast Manual and Electrical Closing

The Pacific Electric Motor Control has a strong spring automatically motor-wound from low AC or DC current and stores power for fast interruptions and reclosures. Manual reclosing is just as fast as electrical. There are no expensive station batteries, no heavy cables, no short-life rectifiers. Write for more facts about Pacific Electric Breakers and why their utility-tested design is so reliable.

C. H. Cutter
1015 Securities Bldg.
Seattle, Wash.

G. B. Kirkwood
437 S. Hill St.
Los Angeles, Calif.

Myron Swendsen
P. O. Box 156
Boise, Idaho

J. E. Redmond Co.
148 W. Madison St.
Phoenix, Ariz.

R. Ackerman
318 Dooly Block
Salt Lake City, Utah

Northwest Supply Co.
909 East 2nd St.
Butte, Montana

Other Representatives in Principal Cities

Pacific Electric Mfg. Corporation

5815 THIRD ST., SAN FRANCISCO, CALIF. DUNES HIGHWAY, GARY, INDIANA

★ ★ ★ ★ ★

WE ARE PROUD

Many of our members have left their civilian pursuits to serve in the armed forces. They are in all branches of the service—wherever their calls have bid them go. Of them we are very proud—and to them we send greetings and best wishes for the speedy completion of their great undertaking.

But we are also proud of those members who are still on the job of keeping the wheels of industry turning at an ever-increasing speed. And these are the members whom we can best serve during the present emergency. The war has introduced many problems into everyone's work—new problems for which there is no background of experience. Serious mistakes and the loss of valuable man-hours can be avoided only through the exchange of ideas, so use your Association as the clearing-house for getting in contact with others who are struggling with the same problems as yourself.

We are proud of our members—service men and civilians alike—and we are proud of our opportunity to render our members an assistance that is more urgently needed than ever before.

PACIFIC COAST ELECTRICAL ASSOCIATION, INC.

601 W. Fifth Street
Los Angeles

447 Sutter Street
San Francisco

★ ★ ★ ★ ★

This
NEWSPAPER
advertisement was published in Washington, New York and Chicago by McGraw-Hill, to make friends for business.

Labor needs SEED MONEY *too*

The Idea is Spreading

Some weeks ago, we began offering mats of the "Seed Money" series of McGraw-Hill newspaper advertisements to industrial managements, for use over their own company signatures. As a result of this offer, our "Seed Money" messages now are being carried in more than 25 newspapers.

An adaptation of the theme is appearing in 1,424 weekly newspapers and 2 national farm journals. In addition, many thousands of booklet reprints of each advertisement are being purchased by various companies for distribution to their employees.

Other companies are reprinting or quoting these messages in their house organs, and newspaper editors are beginning to give recognition to the "Seed Money" theme editorially.

We plan to continue the series in Washington, New York and Chicago newspapers, and in our own group of publications. It will help accomplish this important educational job if more manufacturers will sponsor this, or a comparable campaign in their own localities.

We will be glad to send you a mat of this particular advertisement in 1,620-line size for newspaper reproduction, with the signature space left blank for your own company name.

James H. McGraw, Jr.
President

McGraw-Hill Publishing Company, Inc.

IN many an advertisement, we have thumped the tub about the need for Seed Money, to give *industry* a chance to provide jobs after the war.

Labor is an important part of industry, and *labor* needs Seed Money, too.

After all, the problems of an individual worker and the man who runs the plant he works in are very much alike.

Both face the problem of getting out war production at constantly increasing speeds.

► Both face the problem of what to do about the men who will return when the war is over . . . the manager must plan for hundreds of such men, the worker for a son, or brother, as well as himself.

The manager runs a giant machine, which we call a factory. The worker runs a single machine. Together they are INDUSTRY.

In this sense, every worker is in business for himself. He "rents" the use of a machine, and pays for it with his time and skill. His wages, above his actual cost of living, represent his profit.

In war, each worker is asked to get more and more work out of his machine. Every time the worker does more work in less time, he creates a profit. That profit must go somewhere, and that's where tangled thinking starts.

Some people say "Don't let labor have the profit. That will raise prices and cause inflation." Others say "Labor created the profit, they should have it all." Still others say "Profit from war is unthinkable. It should be destroyed by taxes."

Don't you see that none of these things is true. High

FREE MATS: If you would like to publish this message over your own company name, or distribute it in handy booklet form, write or wire: Research Dept., McGraw-Hill Publishing Company, Inc., 330 West 42nd St., New York.

Labor needs SEED MONEY too (cont'd)

wages cannot raise prices, as long as they are the result of doing more work in less time. Henry Ford proved that a generation ago.

What Creates Inflation?

It is spending, not earning, that creates inflation! War Bonds can be made to control spending, and War Bonds ARE Seed Money. They are the money we put aside to take care of us in the days when our machines will need some other purchaser than the Army and Navy.

The money for War Bonds comes from the profit that is available to labor, management and owners, when machines are run efficiently.

That is the great advantage of capitalism. While we are running our machines at top speed in the titanic waste of war, these same machines are piling up profits that can be used to rebuild our country and our lives when the war is over.

► Part of this profit belongs to labor, part belongs to owners and managers for developing still better machines, part belongs to the customer in the form of lower prices (in war, the customer is Uncle Sam). If that sounds like our Fighting Men get no benefits from these profits, remember that the faster our machines run, the shorter the war will be. If you were a soldier, what kind of country would you like to come back to? One that was flat on its economic back, or one where people were in shape to work and offer you a chance to earn a living?

We believe competition between workers, as well as between industries will produce the goods to win this war faster than any other method man can devise.

The best method ever developed to encourage the competitive spirit is the automatic reward system which we call capitalism.

It's time for folks to understand what makes capitalism tick. We can get more war production, and slip back into high gear faster after the war, if we look at industry the way it is and make our laws and regulations on the basis of the way it works best.

► Here is the formula that is most successful in putting human nature to work on *any* production job, either in war or in peace:

1. Constantly improve the equipment available for the workers.
2. Use the lowered costs thus produced to
   (a) lower prices to consumers.
   (b) raise wages.
   (c) provide incentives for invention, investment, and individual enterprise.
   (d) lay aside "Seed Money" that can be used to start over again at item 1.

"Seed Money" produces better living

► America has always been an inventor nation. Throughout the years, most of the profits of business have been used to buy inventions . . . better machines, more efficient factories, research for better products. We call profit that is "plowed back" into business "Seed Money." Through Seed Money, products are constantly improved, making possible lower prices and higher wages.

Did you know that this process of putting aside Seed Money has been almost entirely eliminated by our tax law?

Congress, in shutting the door on wartime profiteers, wrote the Excess Profits Law in such a manner that it also takes away most of the Seed Money of business.

Industry must have Seed Money to continue the work of making better products available at lower costs, to create more jobs and pay higher *real* wages. The Excess Profits Law must be changed if we are to provide Seed Money for making post-war jobs. If you think so, too, ask your Congressman to review this law and all laws—with this principle in mind:

"Industrial Progress
is the Source of all Good Living."

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION

22 publications, which gather "war-news" from the "war-production-front" through a staff of 153 editors and 725 engineer-correspondents . . . More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

McGRAW-HILL BOOKS

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

This advertisement is available in handy booklet form. (Less than 100 copies free. Larger quantities, $1.50 per 100; $10.00 per 1000.)

McGRAW-HILL

PUBLISHING COMPANY, INC. . . . BOOK COMPANY, INC.

330 WEST 42ND STREET, NEW YORK

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION:

American Machinist • Aviation • Bus Transportation • Business Week • Coal Age • Chemical & Metallurgical Engineering • Construction Methods • Electrical Contracting • Electrical Merchandising • Electrical West • Electrical World • Electronics • Engineering & Mining Journal • E. & M. J. Metal and Mineral Markets Engineering News-Record • Factory Management & Maintenance • Food Industries • Mill Supplies • Power • Product Engineering • Textile World • Wholesaler's Salesman • Business Publishers International Corporation, an affiliate, publishers of Business and Technical Magazines for Latin America, and Overseas Circulation.

ELECTRA'S HUSBAND

"It's an Ill Wind . . ."

ELECTRA muffs one now and then. A lot of problems growing out of increased womanpower in business and industry she might take in stride. But when I told her about the plight of the poor personnel manager who was confronted with a petition signed by eighteen male employees who insisted that something—anything—be done about their new feminine associates, she couldn't come with an answer. Electra was all for direct action, but in delicate matters like this a subtler technique was necessary. Here is an outline of the situation with the manner in which the personnel manager met it with a little inventiveness and engineering advice:

IT all came about when the draft board took men from their jobs in one of our Pacific Coast utilities and substituted from all walks of life members of the gentler sex. Now it is known that women like plenty of hot water for the morning plunge, but in this city, nature has decreed that the city's water supply is a dozen degrees colder than it ought to be. Feminine aloofness to a cold shower was a natural result. Furthermore, today's market is flooded with inferior perfumes. This combination—pretty girls and off-key jasmine—started among the more fastidious employees a rising storm of protest. In winter months, too much of the wrong kind of air could be tolerated, but with humidity on the upswing, a once-happy company was forced to admit B.O. was its one and only saboteur.

To eliminate complaints and restore harmony, the company's new correlating and planning group first took the problem on and proposed the standard remedy of calling unwitting offenders into the office and confiding what their best friends would not tell them. This procedure, however, necessitated a bluntness to which no tactful male could subscribe. The personnel manager had a lion by the tail. No matter how diplomatic in these delicate matters the father-confessor tried to be, blushing maidens looked daggers every time they saw him coming their way. Finer human sensibilities concentrate themselves more in the sharp ends of the optic nerve than in the sense of smell, came the conclusion.

An indirect approach was proposed next. A leaflet was planned at the time of Victory gardens, charmingly illustrated, to allude subtly to the blessedness of flower garden smells. This all-out campaign counted upon the employee to reach through generalities and prick herself with a thorn. Veiled and optimistic leaflets were meant to reach male and female, old and young alike with one mailing. The house organ was to picture chic damsels standing under the apple tree, and headlines posed the truism that blossoms need be no more fragrant than pretty girls. On bulletin boards, advertising material borrowed from Lux and Lifebuoy, served to remind employees that spring is a time of blossoms and company girls should smell sweet.

But each individual was inclined to think that the billboard copy about apple blossoms referred to herself alone, and any adverse wind came from somebody else. The mote was ever in a sister's eye. Failure descended upon the personnel manager again.

"What we need is showmanship," said somebody, and there was born this sure-fire scheme which may revolutionize personnel methods and give the atmosphere of a bubble-dancer to everything that wears slacks.

First, be it explained, the personnel manager walks with notebook in hand from room to room, making what is called a statistical study of cleanliness. Precisely three times he inhales and exhales at every desk and, though employees look up questioningly, the man to the casual observer is only sighing over a childhood sweetheart, thinking about last night's poker loses, or merely taking his health exercises. Now and then he writes symbols in his little book such as pertain to a weather report, but these symbols have meaning only to the personnel manager.

The ingenious part of the plan is a construction called the "wind tunnel." This tunnel, through which the air is slowly blown with an electric fan, stationed in a basement hall, is thirty feet long, and is popularized with such slogans as, "Girls! Enhance your loveliness by this simple test." "Judge for yourself—it's free!" "Does your perfume match your personality?" "Meet yourself in the basement."

Indifferent lassies tripping lightly to the rest rooms are hailed aside by the personnel manager and asked to stand at the front end of the wind tunnel. Several seconds are allowed, while the master mind steers bits of conversation to personality, the offensiveness of half-socks, and dangers of inferior perfume. Then the candidate is hurried to the exit end of the wind tunnel where, so to speak, she will catch herself coming out. Comments thus far have been very encouraging. They divide themselves into two classes, the doubtful and the amazed, as follows:

"Oh, oh! I'll jump into the river." Her voice is scarcely a whisper, and pretty brows contract as the sensitive mind realizes the awful truth.

"Heavens, it's me!" exclaim the more realistic. Tunnel lights are flashed on to confirm that no deceased rodent is inside.

The personnel manager stands smiling to all this, and with professional gesture, invites the lovely creature to the sample table to select any perfume to her choosing. He continues to smile as the employee hurries away, pausing only long enough to glance at a placard which reads, "Nature made you as you are but the personnel manager makes you as you should be."

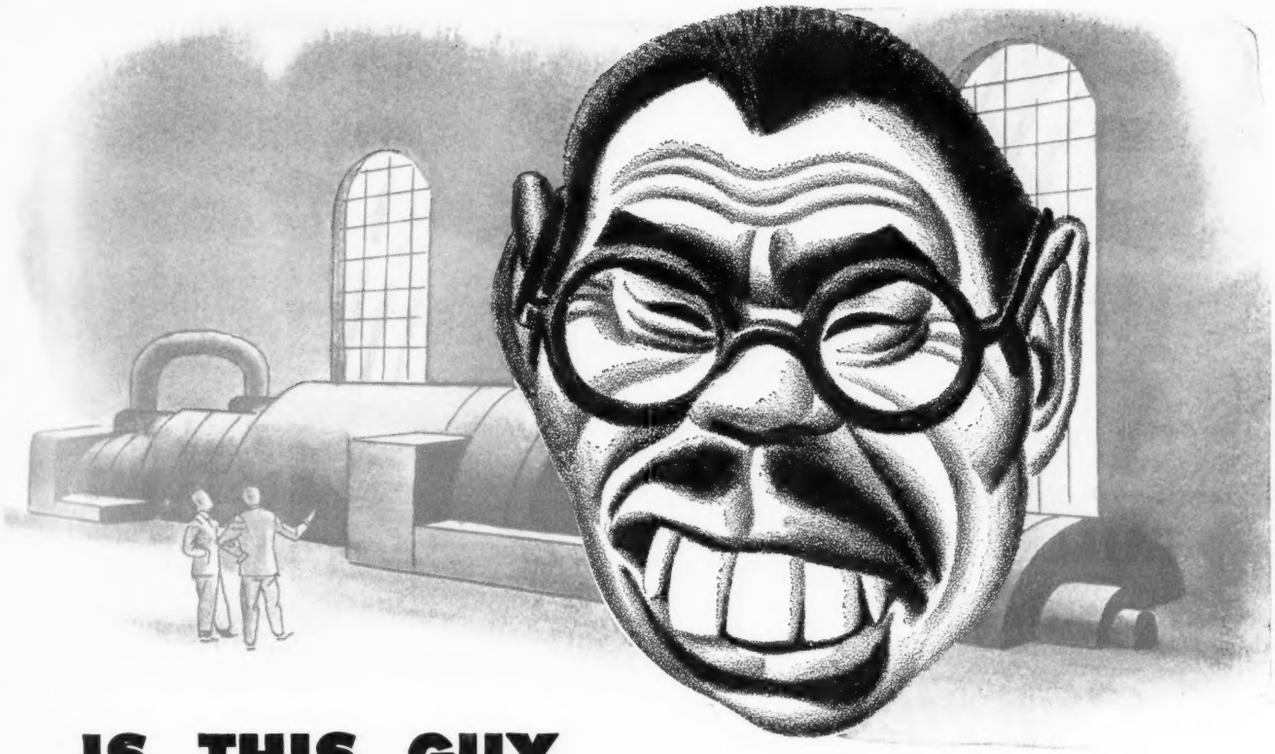
WHEN Electra heard of this delayed olefactory sensitory device, she remembered something.

"Just like the telephone exhibit at the Golden Gate Exposition a few years ago. My voice sounded terrible coming back to me. I don't think I'd like to try that wind tunnel thing."

ELECTRA asked the meter reader who covers our district what he was going to do about shoes now that the No. 17 ration coupon was good for only one pair.

"Wear roller skates here where the roads are paved," he said. "Out where the pavement stops I'll go barefooted."

"I think some of those unrationed sport wedges would be cute, don't you?" asked Electra.



IS THIS GUY SMARTER THAN WE ARE?

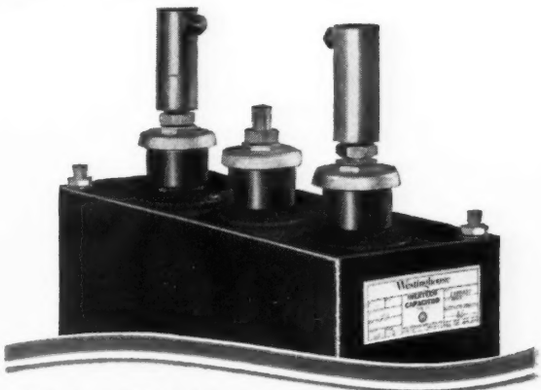
We'd hate to think so. But we *can* take a leaf from his book on "Making the Most of What We've Got."

Handicapped by limited generating capacity and equally limited supplies of critical materials for building new equipment, Tojo had to power a top-heavy war industry. How did he do it? One means was by the prolific use of capacitors. With them the Jap squeezes more Kv-a per unit out of his generating capacity than any other nation on earth.

Yet, according to conservative estimates, our own existing power systems can, by utilizing capacitors which reduce power losses, be made *to release up to 2,000,000 Kv-a for Victory.*

Westinghouse Inerteen Capacitors provide a quick and practical way to tap this huge reservoir of power by quickly relieving lines and equipment of the wattless current resulting from heavy inductive loads. Inerteen Capacitors can be easily installed on distribution circuits with but brief interruption of power. Write for latest literature on Inerteen Capacitors. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

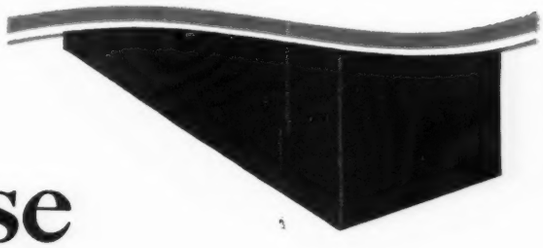
J-60535



⅓ TO ⅔ KV-A OF LOAD-CARRYING CAPACITY CAN BE RELIEVED BY EACH CAPACITOR KV-A INSTALLED

★ ★ ★

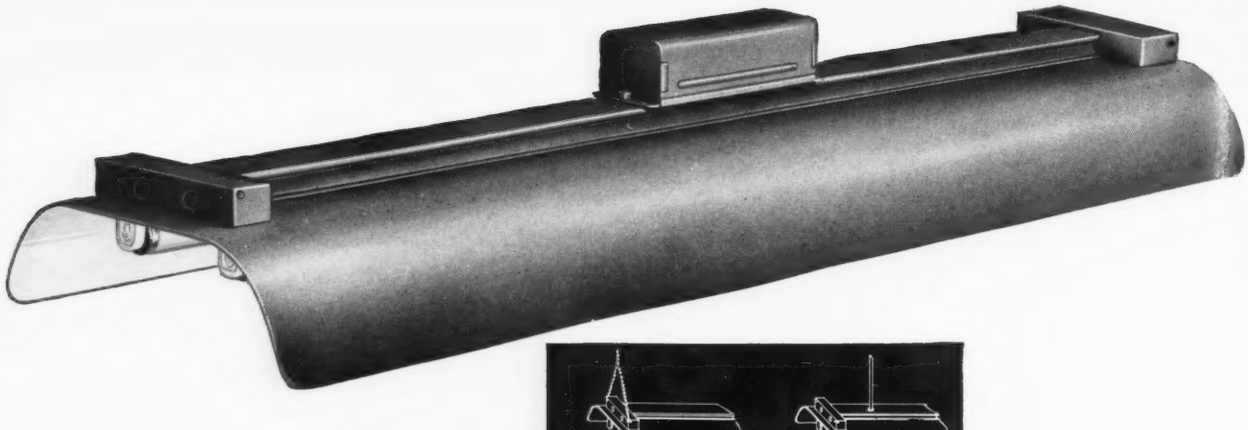
AN EXAMPLE: A utility reduced its load from 92,000 to 83,000 Kv-a by installing 15,000 Kv-a of capacitors—making 9,000 Kv-a *immediately* available for war production.



Westinghouse

PLANTS IN 25 CITIES.. OFFICES EVERYWHERE

INERTEEN CAPACITORS



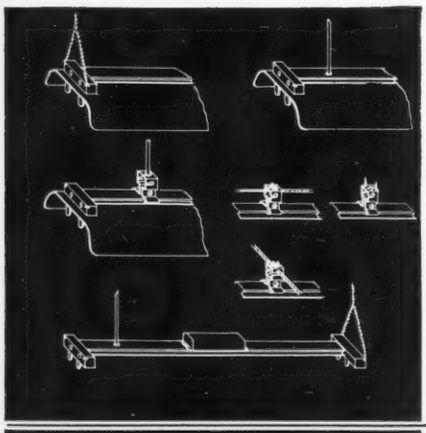
MILLER does it again...with

AERO-DESIGNED

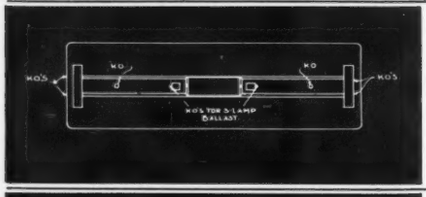
FLUORESCENT LIGHTING!

AERO-DESIGNED fluorescent lighting is MILLER'S answer to recent WPB regulations limiting the total amount of steel in fluorescent fixtures. To war plants, badly in need of more modern, productive lighting, it means in effect MILLER 50 FOOT CANDLER and 100 FOOT CANDLER fluorescent lighting systems are still available *without any sacrifice* of lighting efficiency, economy of installation, ease of maintenance, mobility or rugged construction.

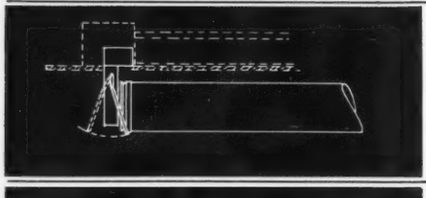
Read carefully, please, the principal features of this new *AERO-DESIGNED* lighting as listed at the right. Then sit down and write MILLER at Meriden for full information . . . or call in our nearest field engineer (located in principal cities) for a specific discussion of how this war production lighting can help you.



FLANGED TOP *of channel permits clamp strap attachment at various points along channel, for ceiling, rod or cable mounting to suit any ceiling structure. Also can be suspended with chains, conduit or combinations of these methods.*



WIRING CHANNELS, *now streamlined, contain all necessary wiring and auxiliaries—with ballasts exposed for heat dissipation. Can be used as individual lighting units or in continuous rows.*



MILLER SAFETY SOCKETS *with integral safety lock to prevent lamps from falling are rigidly spaced and substantially mounted.*

REFLECTORS *are of Masonite with durable IVANITE, the "sealed-in-surface" finish for high reflection factor. Lightweight, easy to remove, simple to clean. Reflectors are "extra length" for good shielding of lamp ends. Miller reinforcing reflector attachment strap assembly is an integral part of each reflector—no change required for either two or three-light units.*

FIXTURES *carry both Underwriters' and RLM Standards labels—are backed by written warranty and MILLER'S almost 100 years of lighting experience.*

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ILLUMINATING DIVISION
Fluorescent, Incandescent
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OIL GOODS DIVISION
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WAR CONTRACTS DIVISION
War Materiel

MILLER
SINCE 1844

ELECTRICAL WEST

JUNE, 1943
VOL. 90 NO. 6

COOPERATION IN THE PACIFIC NORTHWEST

A report from George T. Bragg president of the Northwest Electric Light & Power Assn.

As one looks back over the year that has passed since the last Convention-in-Print and reviews the record of the electric utility industry during the nation's first year of war, he can find much to make him proud. Across his mind flashes the kaleidoscope of events on the economic front—of shortages, of rationing; of bottlenecks that range from transportation and communication to such everyday common public services as hotels, restaurants and laundries; of manpower deficiencies and wage stabilization; of labor unrest; of rising living costs and of soaring federal taxes.

The impact of all these events has affected everyone. Yet through all this he sees the electric utility industry quietly and efficiently turning out the power necessary to operate the nation's war industry—and doing it without the waving of "E" pennants or the blare of trumpets, without rate increases, and, in fact, with some rate reductions and with a continually decreasing average price to the public. Despite frequent predictions to the contrary, he sees no power shortage develop, even in the fastest-growing war-production centers.

Truly our industry has cause to be proud and the people of our nation cause to rejoice in the way the industry has withstood the impact of the grimmest, toughest war the world has ever seen.

In seeking reasons for this result here in the Pacific Northwest—and I do not presume to speak for the industry outside this territory—I should like to offer two prime ones. Both are born of cooperation. The first is cooperation between management and the rank and file of company organizations. In the face of a serious syphoning off of workers from the electric industry to the armed forces through selective service and to new war industries through the lure of high wages, the rank and file of industry personnel, the older ones who remain and the newer ones who have stepped in to fill the ranks, have carried on nobly.

This has been one of the chief problems of management. Some companies in fast-growing industrial centers have suffered as much as 100% turnover in some departments in the course of a year. Yet the wheels of industry and commerce for which our systems are responsible continue to turn; the housewife continues to cook and to heat water electrically; and customer service, though streamlined in some respects, has not ceased to function. In addition, the industry has furnished a generous share of its people to work on civilian defense organizations, War Bond drives, Community Chest and Red Cross war fund campaigns and other civic affairs.

BRAGG

It is to the rank and file of personnel that credit for this accomplishment belongs. I refer here not only to those actually concerned with keeping power on the lines but equally to those whose work may seem to them a little removed from this vital service—the meter readers, home service advisors, clerks, office workers and former salesmen now engaged in other company operations. Theirs has been a service not likely to be publicly recognized by the striking of medals; yet without their loyal attention to their jobs in this essential industry, this country could not win this war. Not only are their jobs important on the production front and in the maintenance of civilian morale; they are equally important in perpetuating the things we all are fighting for. Their work helps keep these companies strong and solvent; helps to keep them in position to meet their responsibilities during the war and in the readjustment period sure to follow; helps to perpetuate the American system of free enterprise.

The second basic reason for the successful operation of our industry in this region is the cooperative spirit behind the Northwest Power Pool, one of the most successful pools in operation in the country. This cooperation exists not only between the member business-managed private companies, but between municipal power bodies and these business-managed companies, and between the federal power system of Bonneville and Grand Coulee and the municipals and the business-managed companies.

In this voluntary pool are eight business-managed systems, two large

municipals and the Bonneville Administration. Coordinated by a group of engineers from the member systems, the pool operates through a transmission network blanketing the five Northwest states almost as though the network were one system directed at serving not only the individual interests of each section but the larger interests of the entire region as well. By keeping the participants as free agents and putting cooperation on a voluntary basis, full advantage is taken of the seasoned experience of men who have operated these systems for years and know the individual characteristics of their plants and lines as they know their own children. By scheduling interchanges of power between adjacent systems in accord with conditions of water supply and system load at the time, full advantage is taken of the diversity of the several watersheds of the region, of the diversity of time between the eastern and western parts of the thousand-mile region covered, and of the diversity of load found in the varying areas, from the mines of Montana and Utah through the agricultural areas of Idaho and central Washington to the shipbuilding industry and other war enterprises on the coast.

This pool is a logical expansion of the plan of interconnected operation successfully pioneered 28 years ago by our Northwest companies. Through it an estimated 70,000 to 100,000 kw. in peak capacity has been added to the resources of the region. But more important, it has helped meet the large increases in energy needs for high load factor chemical and metals operations and for 24-hour shifts in dozens of large industries. It should be stated for the record that generating capacities have been added in the region at the government plants at Bonneville and Grand Coulee. Without these the government could not have brought into the region as much new war production as has been added during the past two years. In addition, the business-managed companies have made some small increases of capacity, chiefly by additions to existing plants and through interconnection with energy-producing customers who have surpluses available.

In addition to this vital responsibility of making more and more energy available for increasing wartime loads, all the companies have met other obligations of all-out war. They have provided extensive protection of utility properties from potential sabotage and bombing, and, in cooperation with local civilian defense councils, have set up working organizations for maintenance of utility services and for general civilian protection in connection with possible air raids. To further minimize the threat to continuity of service from air attack, the pool members have worked out on paper a pool of critical equipment available in the event that any company finds itself in distress from the hazards of war. This equipment pool, which also offers the loan of manpower and tools for emergency service, is in addition to the WPB pooled inventory of surplus materials set up as a conservation measure.

These cooperative movements, as well as the solution of numberless other problems arising out of the war, have required close cooperation with government agencies—the FPC, the WPB, the OPA, the ODT, the WMC, state commissions, local civilian defense authorities, and local draft and rationing boards. Relations with these new and old government agencies have on the whole been most harmonious. One could not in truth say or imply that every problem arising from the controls exercised by these governmental bodies has been solved to the entire satisfaction of everyone and without confusion. But, by and large, mutual understanding and a harmonious relationship exists between our companies and the representatives here of these government agencies, and the business of getting our war work done promptly and efficiently has not faltered.

In solution of many of these problems, the Northwest Electric Light & Power Assn. has played an important part. It has furnished a vehicle for conference among its members and for exchange of ideas and experiences on expedients adopted for the streamlining of our utility operations, and has acted as a clearinghouse for coordinated action when such action was necessary. At this writing, three conferences for the key men in their respective departments of the member companies have been held.

The Utilization Section, as the former sales and business development group is now called, went fully into the matter of its changed functions under a wartime economy. Aid to industrial and commercial customers to keep up production under new dimout regulations and priority restrictions, home service under gasoline rationing, ways of assisting the farmer in the production of more food, the function of advertising under conditions in which one has no merchandise to sell —these and other important problems were well threshed out at a meeting in Portland in November.

In December the Accounting & Business Practice Section brought its group together in Seattle to review experiences in streamlining customer service practices under the new restrictions—meter reading, collections, the handling of the new Victory tax, procedures to comply with P-46 and new accounting problems raised by the interchange of power in the power pool.

Engineers and operating men followed with their conference in Seattle in January. Here such matters as substitution of non-critical for critical materials in construction, cataloging of surplus spare equipment, problems of priorities and control of materials, new ODT rules with respect to truck and passenger fleet operation, protection of plants and stations from sabotage and bombing hazard, and similar new operating problems were treated. Other similar meetings are planned as new problems arise on which the experience or opinions of others can be helpful.

The perennial efforts of the advocates of public power to extend public ownership and operation and to gain possession of the business-managed power industry in this region appear not to have progressed during the past year. In fact, they appear to have lost ground through the growth of public understanding of what this movement really means in the way of advancing the trend toward socialization of America's free enterprise system. This philosophy, born years ago as a municipal ownership proposition and attracting to itself sincere socialists and self-seeking political opportunists, lately has been thrust toward its only logical ultimate conclusion—bureaucratic control. But this very change and intensification of the movement, with its bitter taste of control from afar, has put before the people the true socialistic significance of the program. And as the people become informed, their voice becomes more articulate and their influence more effectively exercised.

The Bone-Smith proposal in the 77th congress to create a Columbia Power Authority and set up a vast federally-controlled power empire in the region was shelved after hearings before a joint congressional sub-committee. Subsequently some of the same elements behind this measure proposed, as an adroit substitute, a scheme to be presented to the Washington state legislature as a state measure. This measure, known as Initiative 12, was aimed to accomplish by indirection what had failed by direct action. It was passed by the legislature with its thinly-disguised emergency clause, intended to prevent its coming to a public vote by referendum. The state supreme court, however, unanimously denied the emergency nature of the legislation and thus made it subject to referendum.

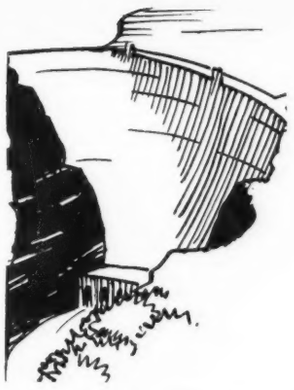
At this writing, thousands of Washington voters are signing petitions to bring the measure to the polls at the general election in November 1944, as Referendum 25 for decision by the people.

Meantime, public utility districts here and there have taken piecemeal action through condemnation suits against segments of the property of various companies. Juries representing the people, however, in each instance have demonstrated that America still believes in fair play. They have found values for the utility properties sought to be condemned equal to two or three times the values set by the utility district "experts." As a result of these determinations of just value, no major take-overs of utility property have been concluded.

An interesting sidelight on the whole question was provided by a poll of public opinion in Oregon and Washington conducted by Dan E. Clark II & Associates. This poll showed a two to one sentiment against a Columbia Power Authority such as was contemplated in the Bone-Smith bill, and four to one against the adoption of any such proposal during the war. Particularly significant in this poll was the eleven to one decision in favor of having the public ownership question decided by a vote of the people in the local communities affected rather than by congress. Electric rates were considered reasonable by a margin of five to one.

The lessons being learned today in the cooperative operation of the power pool are demonstrating that public and private power enterprise can exist side by side, and, in collaboration with each other, can function more beneficially to the public they respectively serve than they can alone. This movement, brought to fruition as a war expedient, can fit well into the economic readjustment to come after the war, and this harmony in operation developed among people of diverse political beliefs for the best interests of the war program may readily prove itself to be economically beneficial in times of peace.

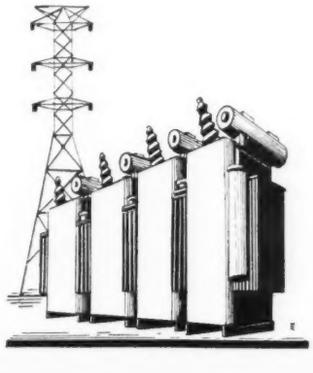
This brings me to a thought or two in connection with postwar planning. I should not like to be classed among those who see an early end to the titanic struggle in which we are engaged. Complete and decisive defeat of our enemies is and should be our sole immediate objective, and I do not think it can be achieved easily, painlessly or soon. Nevertheless, the war will one day be over and we then can turn our energies, now devoted wholly to those things which bear on ultimate victory, to the inevitable problems of reconstruction. It is not



premature to point some of our thinking now toward that day so that we may not be wholly unprepared for the adjustments that will have to be made.

We can hope and expect to retain in this region much of the changed economic structure that has developed with the war program. We will continue to make aluminum and other metals and chemicals, and to build airplanes and ships, for these are things of peace as well as war. We shall convert our machine shops and other manufacturing facilities once more to the uses of peace. But we should not expect to do these things on 24-hour shifts. We can, therefore, expect the release of great numbers of workers now engaged in war industries and in the armed forces who must, of necessity, find other occupations.

The more planning by private enterprise for our after-the-war economy, the less the government will feel called on to do. The government function in this transition period might well be to supplement the activities of industry and commerce by filling in the gaps of unemployment with constructive wealth-producing public works. One such project of definite value to this whole region would be the immediate completion of the reclamation features of Grand Coulee to bring into intensive cultivation 1,200,000 acres of lands now supporting a mere handful of people. Several thousands of workers could be employed on the pumping plant, canals and ditches to bring water to these lands. The subsequent colonization of these lands by



the 30,000 farm families it is assumed they will be able to support would create a new population in the state of Washington carrying with it substantial new business opportunities for the many services these people will require and a substantial new market for many commodities manufactured all over the Pacific Northwest.

Our industry should be in the vanguard of the industrialists and business men who should collaborate on such sound industrial planning. Farm chemurgy offers one promising outlet for this planning effort and many companies already have taken a prominent part in the establishment of farm chemurgic councils in the several states. Other joint movements will develop in which the industry should take prominent part.

In our own internal affairs, we undoubtedly will find that operating under war conditions has taught us many lessons. Some of the short cuts we have applied to our operations as war expedients will remain with us for economy reasons, producing benefits that can be passed on to the public.

In the field of commercial development and sales, many opportunities for productive planning lie ahead. Spare capacity, released by the slowing down of war's demands, will be available once more for the demands of peace. Our customers' pockets will bulge with war bonds, and their desires for conveniences contributing to better living conditions, now suppressed under the restrictions necessary in an all-out war, will give the starved research laboratories of our manufacturers a field day. In the process of converting manufacturing plants back from munitions to consumer goods, there will be plenty of work on the selling front for the utility and its commercial allies, the distributor and dealer. Let us point our thoughts in this direction occasionally, and let us direct the thoughts of our customers to the kind of job we will be able to do for them and for our American standard of living when our enemies are smashed.

The inherent strength and fundamental rightness of this industry has been demonstrated through many crises of war and depression. Always we have emerged more valuable, more useful, more important to growth and progress. This fact should give us renewed assurance and confidence of our rightful place as an essential unit in the social and economic destiny of America. Let us fight this war now, from that philosophic background, to the limit of our capabilities, and let us at the same time keep our vision ever focused on the better days inevitably to come.

SERVING THE PRODUCTION LINE

GAYLORD B. BUCK, President
Rocky Mountain Electrical League

ELECTRICAL leagues no longer are promotional organizations. With few exceptions, they have developed into liaison agencies between the electric industry and the nation's armed forces. This all-out war job probably is their chief justification for continued existence.

"What is the league doing for its members, now that promotional activities have been stymied?"

One answer to this question is that the leagues are helping to make certain that, through victory, their members will not be doing the goose step after the war. In this respect, the industry "builded better than it knew" when it brought into being its galaxy of electrical associations. These bodies today not only are vindicating themselves, but they are serving to justify the industry and, at the same time, rendering a definite service to our war endeavors.

Speaking for the Rocky Mountain Electrical League, whose peacetime activities ranked it as one of the nation's leading trade associations, I can proudly say that it has dedicated its full resources and energies to the war effort. In May, the organization rounded out a full year since it converted its efforts from normal pursuits to a program of cooperation with military bodies and war agencies that has contributed materially to the efficiency, defense, comfort and morale of Uncle Sam's armed forces.

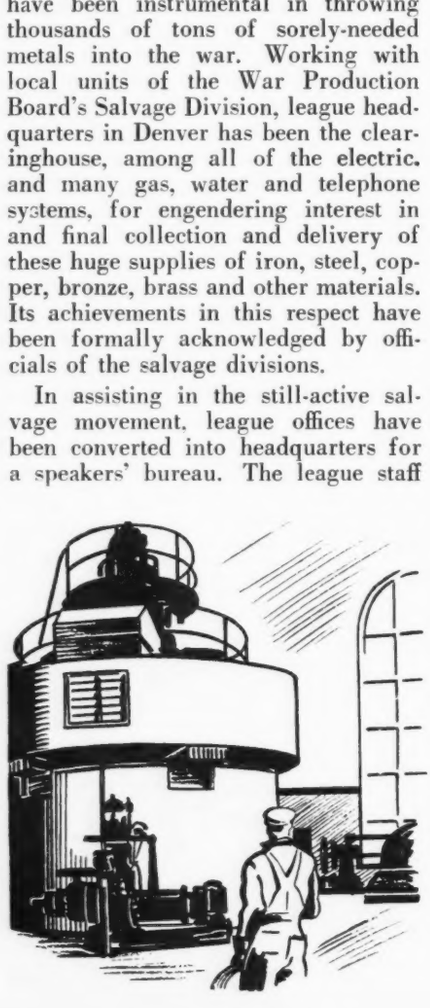
The same aggressiveness which the league and its membership employed to introduce the conveniences and efficiencies of electrical energy in the home is now being employed in the protection of these homes by insuring the eventual victory and return of those absent therefrom because of the war.

In following its multifold activities, no spectacular, easy-to-see implements of war have flowed from the league's production line. However, its output has proven to be just as tangible in the ultimate—for the products of its ardor have gone directly into tanks, guns, projectiles, armor, planes and other war accoutrements. In achieving these results, the endeavors of the league have not been confined to campaigns and other spasmodic efforts. The best minds and most patriotic workers among the electrical manufacturers, distributors, contractors, dealers, utilities, engineers, and others identified with the industry of the Intermountain region, have been recruited to contribute their talents, their time and their labor on behalf of their government. They have headed or composed committees and other bodies that have served to spur the people of the area as a whole to greater wartime contributions. These league members have thus contributed countless man-hours and a wealth of critical materials and supplies that might otherwise have been lost or delayed in their uses.

Unique Contributions

From rusty files and horseshoeing rasps, which have been converted into combat knives for our forces in the Pacific, to ponderous ten-ton mining and electricity-producing equipment, the league's well-organized divisions have been instrumental in throwing thousands of tons of sorely-needed metals into the war. Working with local units of the War Production Board's Salvage Division, league headquarters in Denver has been the clearinghouse, among all of the electric, and many gas, water and telephone systems, for engendering interest in and final collection and delivery of these huge supplies of iron, steel, copper, bronze, brass and other materials. Its achievements in this respect have been formally acknowledged by officials of the salvage divisions.

In assisting in the still-active salvage movement, league offices have been converted into headquarters for a speakers' bureau. The league staff also has prepared radio continuities and announcements, newspaper articles and other publicity directly related to the government's effort to obtain scrap contributions.



Surplus Material Distribution

Of equal importance has been the league's administration of the listing, purchase and sale of surplus equipment among all classes of public utilities in this area and in several adjacent states in which it operated, at the behest of the Power Division of the War Production Board. In performing this task the league has been responsible for the utilization of hundreds of pieces of critically-needed machinery, transformers, and other equipment, as well as many thousands of feet of copper wire, cable, conduit and similar materials. League headquarters is now recognized by all related industries in the Rocky Mountain region as the dispatching point for these supplies, the exchange of which among companies has stepped up war effort by relieving manufacturers of the necessity for providing them under the prevailing priority system.

Regular War Conferences

In addition to continuous weekly and other periodic meetings, to keep the membership fully advised and up to date on priorities, price regulation and other current problems, the league holds frequent all-industry conferences. These conferences bring together the presidents, managers and other officials of the utilities and other companies, to establish war policies and practices in consonance with government recommendations and requirements.

The league's Engineering and Technical divisions, headed by O. P. Reed, Cheyenne, Wyo., were among the first groups in the nation, after the declaration of war, to establish procedure for protecting against sabotage of government projects, power plants and other civilian business and industry. In the interest of the entire population of the Rocky Mountain states, the league's Lighting Division quickly convened members from all states in the area to perfect air raid and blackout procedure. Personnel and facilities of the league were instantly placed at the disposal of federal government, state

and municipal officials. The league became the clearinghouse for inquiries from all sources for light control and blackout advice and information. The chairman of the league's Lighting Division, in recognition of his abilities and the service rendered by his committee members, is now chairman of the Colorado Defense Council Advisory Board.

Power Problems Attacked

As the Rocky Mountain area became a choice location for munitions plants, air fields, chemical plants and other vital undertakings, the league summoned its power company managers and engineers to take appropriate steps to safeguard these enterprises and insure continuity of electric service. The pooling of power resources of the region, as well as the protection of lines and equipment, were prime objectives of this branch of the league's technical forces.

In meeting government requirements on tire and gasoline restrictions, the league's membership readily complied by instituting, following a series of meetings, methods of rendering service and conducting business without hampering government efforts or inconveniencing the public. Through the league's Accounting Section, chairman of which is Harry Adler, entirely new methods of servicing appliance breakdowns, outages in homes, factories and business places, were perfected. Meter reading and collections by mail relieved personnel and usage of tires and gasoline. All member companies quickly adopted the recommendations and practices established in this respect by the league.

Cooperation With War Effort

In furtherance of its war program, the league met every challenge for cooperation and assistance. Its officers and members took leading roles in conducting War Bond campaigns, Red Cross drives and similar undertakings. It was the first business organization of record within the territory it serves to throw its full support to the national movement to collect waste fats, tin, rubber, silk and nylon stockings and more than a score of other much-needed items. In this connection, the league and its member companies in Wyoming were responsible, in a large measure, for the establishment of two national salvage records. Wyoming women, spurred by the many thou-

BUCK

sands of pamphlets distributed among them by their light and power companies and urging conservation of kitchen fats and silk and nylon stockings, during January, on a per capita basis, excelled the women of all the 48 states. States within league territory shipped 29,775 lb. of stockings, according to L. J. Todhunter, regional salvage chief.

In pursuing its salvage program, the league has established what it terms War Service Centers. These War Service Centers are located on the now empty sales floors of the utilities formerly engaging in the merchandising of refrigerators, radios and other electrical appliances.

The league's War Service Centers include War Bond booths, Red Cross recruiting stations, salvage depots and provision for contributing files, knives, phonograph records, books and other needed articles. In addition, the War Service Centers make provision for demonstrations and instruction in the proper use and maintenance of electrical equipment which can not now be readily repaired or serviced due to the scarcity of experts, now in the service of our country.

War Poster Contests

In furthering the national salvage program, the league promoted and provided war stamp awards for war poster contests. Hundreds of these posters were created by junior and senior high school students and have been the inspiration for similar projects elsewhere in the nation. The prize winners were reproduced in color for display in stores and other public places, to encourage greater saving of fats, contributions of discarded hose, tin and other wanted items. Official recognition for the league's innovation in this respect came from Washington.

As evidence of the league's widespread aid to federal agencies and their numerous units, military bodies and patriotic organizations, records in its headquarters' files disclose that it has collaborated with the following: The Army, the Navy, War Production Board, Office of Price Administration, American Legion, American Red Cross, Defense Council, American Women's Voluntary Services, Colorado Vocational Training School, Office of War Utilities and Denver Opportunity School.

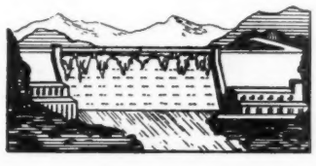
League President Has War Cabinet

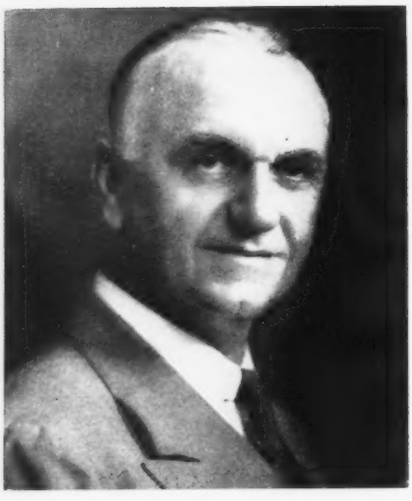
The league, during the business lag a few years ago, coined the expression: "You can't economize yourself out of the depression; you've got to sell yourself out."

A business-recovery program that suited this expression, which became a national slogan, was adopted, along with the program itself, by the electrical industry generally. Now, the league is employing the same technique and leadership to sell the electrical industry—and the people—into war effort and support.

Pursuant to present objectives of the league, it has formed a War Cabinet, comprising the leaders in every branch of the electrical industry of the Mountain region. On the New Mexico front are Arthur Prager, Albuquerque Gas & Electric Co.; E. A. Bradner, Las Vegas Light & Power Co.; H. E. Samson, Southwestern Public Service Co., Roswell. On the Wyoming sector are H. H. Lenhart, Cheyenne Light, Fuel & Power Co.; J. W. Alexander, Rawlins Electric Co.; W. D. Johnston, Mountain States Power Co., Casper, and J. B. French, Black Hills Power & Light Co., Rapid City, South Dakota. The Colorado officers comprise the headquarters' staff, including J. M. DePue, General Electric Supply Corp., T. M. Foulk, chairman of the Denver chapter of the league, and others representing the Westinghouse, Graybar, Kelvinator and similar national manufacturing concerns. League Manager George Lewis is liaison officer.

As war activities continue, the league is stepping up its tempo, expanding the scope of its influence and participating as a direct aid to the United States government in every respect except upon the actual firing line.





GATES

FACING OUR WARTIME RESPONSIBILITIES

S. E. GATES, President
Pacific Coast Electrical Association

ON Dec. 7, 1941, Americans everywhere were struck with cold horror as news of the cowardly attack on Pearl Harbor was broadcast to the world, and Americans everywhere began their search for ways and means to find the shortest and most efficient methods of organizing for the long uphill struggle toward ultimate victory with a minimum of ultimate expenditure in men and dollars.

The first problem of the individual and of companies was to analyze their several responsibilities and facilities for contributing their individual parts, which was immediately followed by the Herculean problem of developing a practical method for the immediate and thorough nationwide cooperation. The next problem was that of placing the services of these groups at the disposal of the government, as the occasion developed, in response to any suggestion or request in connection with the rapidly developing program for the furtherance of the war. The large number of Army and Navy "E" awards made within industry is evidence of a job well planned and carried out.

The electrical industry in all of its branches has taken a leading role in this planning, placing all of its available resources and manpower at the disposal of the government.

Your Pacific Coast Electrical Assn., through its board of directors, and through the cooperation of all of its members, threw itself into high gear to contribute its part in the coordination of the industry's activities. Result is that every activity must measure up to the question, "Will it help win the war?"

It seems appropriate at this time to give a brief summary of the part which has been contributed by each branch of the electrical industry, and to look at the plans which are being made for the future.

The utilities have provided an adequate and dependable supply of power which is so essential to the production of ships, airplanes, tanks, munitions, and to the supplying of Army camps and cantonments. In January 1942, as a result of conferences, discussions and planning, the National Council of Electric Operating Companies was created and dedicated to a single purpose—to place itself at the disposal of the government and the war agencies for whatever it might be called upon to do toward promoting victory. Local groups, such as the Southern California Power Interchange Committee, have set up systems for the interchange of power and for the production of additional generating capacity. Electric power production capacity ample to meet every war demand is now assured in this area and studies of the industry indicate that this power supply will continue to be adequate for all war needs.

The national total of generating capacity at the end of 1942 was 46,600,000 kw., with a total sum of demands at 36,900,000 kw., which would indicate an ample margin of safety. Even with this margin of safety, plans are now underway which will provide additional generating capacity during 1943 of 3,800,000 kw., and during 1944 of a substantial further addition.

A further evidence that the utility industry of the country has met the demands placed upon it is evidenced by the caption on recent publicity in the local press all over the country, which read: "*You don't have to stand in line to buy electric power.*" In this day of rationing and shortages in almost everything contributing to the over-all war production picture, this is, indeed, a high tribute to the utility branch of the industry.

Another important branch of this electrical industry consists of the electrical manufacturers, who have, within a remarkably short space of time, converted from production of peacetime goods to production of wartime material. Today the electrical factories of our entire nation are converted almost one hundred per cent to the production of war materials. This conversion of existing facilities has not only taken place, but at the same time enormous expansion of production capacity has been made, by increasing the capacity of existing equipment through better methods, higher efficiencies and standardization of materials.

Through the methods described above, production facilities of the electrical manufacturing companies have been increased many fold. One outstanding example is a local company on the Pacific Coast, whose total volume produced in January 1940 was $67,000, and the corresponding production in January 1943 was $1,900,000—an increase of 3,500%. Among the largest electrical manufacturers of the nation increases from 400% to 500% were not uncommon.

Another important branch, the electrical wholesaler, has contributed its part. In the early days of the war it very quickly became evident that there would be no appliances and equipment, ordinarily used for domestic consumption, produced or available for distribution. These organizations, which in the past depended largely for their existence upon the distribution of appliances designed for better standards of living, faced the necessity of reorganizing personnel and facilities for supplying war industries. This was accomplished by re-training of personnel and by developing new sources of supplies. This conversion was rapidly carried out, so that war plants, where necessary, were able to secure without delay services and material for expanded operations.

The electrical contractor is also an important link in the chain of the diversified groups making up the electrical industry. He has had his load multiplied many times through the necessity of revamping wiring systems in existing plants which have been speeded up for increased production, of building new factories, new Army camps, new cantonments and new housing facilities for the war workers who are being transported into the war production areas. The contrac-

tor's problems have been many. He has had largely to expand his personnel and train new personnel to handle this increased volume of work. He has had his problems in getting suitable materials and working out methods of using substitutes where necessary, due to inability to get the standard materials with which he had been accustomed to work. The electrical contractor has met this obligation and has contributed his part.

The electrical retailers soon learned they had new problems facing them. Their source of supply for merchandising items, almost over night, was dried up. It very soon became apparent that appliances which had been distributed to the ultimate user in the past must be kept in operation during the war period, and many appliances which had been put out of service, due to lack of minor repairs, must again be brought into service through such repairs. The housewife needs the services of these labor saving devices now more than ever in the past, to release her from some of her household burdens for a variety of additional wartime activities.

The retailers have sensed this responsibility. They have organized repair and maintenance crews and trained new men for this type of work.

Another part of our chain which must be maintained intact if the industry as a whole is to carry on, is the electrical inspector, who has problems peculiar to himself. He has had to become familiar with substitute materials, and to be sure that these substitute materials are properly installed so as to keep fire and accident hazards at a minimum. He has had the problem of retraining his personnel and training new personnel so that they will be competent to inspect and approve new installations, rejecting those which present a hazard.

Through our Pacific Coast Electrical Assn. we have been able to aid in the coordination of all of this multiplicity of responsibilities. We have learned how to produce and to use substitute materials where critical shortages have prevented our securing materials which had been standard in the past. We have increased production. We have met demands for new installations and we have learned how to keep existing equipment in operating condition. These things all contribute their part to the winning of the war.

The individual employees of each of these many groups have, in my mind, made "enmasse" the most outstanding contribution of all. The individual man and woman have assumed their phase of war effort, and in addition to this, in most cases, have assumed additional responsibilities in civilian defense work and have uncomplainingly adjusted themselves to fewer comforts and conveniences of life.

I would be remiss in my responsibility if I failed to make some comment on postwar planning which is so essential to the winning of peace. We must not permit this postwar planning in any way to detract from the immediate job of winning the war. Neither must we blindly go on without such future planning. We all have our part to do, directly or indirectly, in furnishing food, clothing and material, not only to the people of our country, but to the people of the devastated countries of the world.

There is a great postwar era coming in which we must contribute our part toward postwar economy. We must plan for full employment, full production and maximum national income. Electricity is a vitally important factor in reaching these goals.

In the postwar era there will be an abundance of electrical power available. It will then be our problem to supply the outlets and appliances through which this power is to be absorbed. There will be postwar housing to meet the wartime deficit, which will require the combined efforts of the contractors, manufacturers, suppliers and retailers. There will be a large pent up demand for appliances to fill the voids caused by lack of production of such appliances during the war period. There will be postwar modernization, through which we will be able to profit by multiplicity of new materials which have been developed due to the war effort, and which can be adapted to better postwar products. There will be large numbers of new appliances and devices, contributing to higher standards of living, which will be the result of things we have learned through the war effort. Our problem then will be the adapting of these things to peacetime living.

The war effort has shown the necessity of a largely expanded industrialization on the Pacific Coast, with plants here to meet the demands of this area, and to meet the expanded demands across the Pacific. We are indeed facing a great industrialization era in this territory of ours.

For the reasons as enumerated above, your association organized in the beginning of its current administration, a committee designated as the planning committeee. This group has assumed the responsibilities of studying and analyzing the immediate and postwar problems. It has served as an advisory committee, to study the problems which the present emergency has developed, and it is preparing to make, from time to time, recommendations to individual companies for the solution and carrying out of those things which can be done to advantage in solving these, our many problems.

This committee cannot in itself put into effect any definite plan of operation, but it can, and will, make recommendations to the companies making up the class "A" members of our association, suggesting plans and programs which can be adopted by local committees within such companies, to carry on the most efficient methods toward winning the war, and to plan an orderly way under which reorganization can be perfected without delay immediately following Victory Day.

INDUSTRY, TAKE A LESSON FROM THE PIED PIPER

KIMBALL I. JACK
Washington Water Power Co.

IT seems reasonable to suppose that a superior human mind which can look at a red planet suspended in space three hundred million miles away and determine its precise size, weight and temperature should also be able to look down a city street and determine the whys and wherefores of human behavior. That lesser lights who are somewhat lame in scientific approach, must write articles in an effort to orient our own feeble thinking is unfortunate. It would be much more satisfactory for all concerned if the top men of science would take time to delve into the mysteries of public relations and advertising and solve these cosmic, if not comic, problems for us.

First, it may be asked, what is the problem referred to?

It is simply this: Government has suddenly matured; has donned a gardenia, calls itself Pied Piper, and by means of a bewitching tune is leading the masses away from the owners and leaders of industry. No attempt is made in our little drama to describe the government as "villain" — that would be infantile. The government pipes a tune, nothing more. However, it is to be asserted that the masses, as always, are selfish little mice, who like music; and we may add that industry on the other hand does not intend to allow its children to stray to the witch doctor if it can be helped.

Come along to the city's outskirts and listen to the tune our Pied Piper plays on his lute. It is about the four freedoms, an entrancing melody about freedom from want and freedom from fear. People in the tenement district hear a reedy tone piping insistently about "the more abundant life" and "equality." Workers sitting in the tavern, translate the tune into terms of their own employment. Mistaking equality of opportunity for the real McCoy, they follow the Piper.

What is the result of this social disturbance? Cry the savants: "We are in an economic revolution." "It is the people's era," say the braintrusters; and, with brown-colored socks and perspiring feet, the hordes of "isms" step triumphantly to the microphone to shout that civilization is on the march! In addition, many a business leader, who himself is not yet occupying the hot seat, seems to think our comedians—Government, the Masses and Industry—are having a very amusing time of it, a pleasant tug-of-war. But is it amusing? Today's farce may not prove so pleasant as time goes on. One of the three stands a good chance of serious injury and history suggests that, in the long run, it will not be the masses. That leaves two sides to bet on, Pied Piper and Industry. The answer now depends on who can pipe the best tune.

Before any recommendation is made as to how Industry may proceed to retrieve her stray children, it may be well to drag into the stage a few basic considerations. These considerations are as follows:

1. Huge government dams costing the taxpayer hundreds of millions of dollars, and promoted partly for purposes of irrigation and flood control, now bedeck our landscape. They cannot be blown into kingdom come. Regardless of whether people accept or reject the theory of these projects, common sense now demands that these dams be put to the best possible use.

2. Public opinion surveys and elections show a sizable percentage of voters in any locality as favorable to public operation of the electric industry for two simple reasons. One reason is prejudice, and the other reason is personal gain. The scholar who once said that the whole basis of civilization rests upon people who feed their bellies and then feed the ego, was not far wrong. Public opinion surveys give meager insight into the human mind. People tell us that they desire public ownership because of high rates, alleged high-handed procedure, unsatisfactory service policies which mean denial in one thing and another, and people make reference to Wall Street. What we are not told by opinion surveys is the subtle relationship that exists between prejudice and personal gain. Because the problem is a knotty one, too many of us are inclined to ignore it altogether.

3. Apart from opinions of the voters, there is a highly organized, aggressive and intelligent group, supported by virulent social theorists, that is determined to wrest economic control from leaders of the past 20 years. The first step is complete confiscation of the electric industry.

4. Constitutional government, as such, is confused with specific evils of various departments of government. Personal resentment makes the Pied Piper all inclusive, and a giant; which he is not. Consider the forest service, the coast patrol, the postal system, bureau of standards and legislative groups. These useful services are accepted by all, yet are a part of government. What industry means to hate is radicals who have stolen, perverted and misused terminology of democratic government. What industry means to oppose is particular departments that are now flying the "Jolly Roger" flag. But for industry to be antagonistic to government, for people in industry to call government villainous, is not only childish but futile. It ranges the masses and government on one side against industry. That is bad. Future years can expect more government, not less. As population increases—and population has doubled in the past 50 years—a crowded world may expect more supervision and regulation. And, as long as the masses look upon government as protector and friend, industry can well afford to turn Pied Piper and propose such cooperative arrangements as will be agreeable to all.

5. While management has made splendid headway toward a solution of the problem in recent months, the rank and file of industry still seem to cling to a number of curious beliefs. These beliefs, almost traditional, would have it that—(a) People opposed to business management have no real, but only imaginary, cause for antagonism. (b) Inertia is more to be desired than action. It seems to be industry's belief that every upsurge will in time play itself out. (c) Advertising will remedy most evils and no other action is necessary. (d) It is industry's sacred duty to conserve money in time of

peace, but to spend lavishly in time of emergency. Like the penny pincher, industry often refuses to spend two dollars for a dental examination when things seem all right, but offers thousands for some kind of cure when comes a toothache. (e) The loyalty of business men, voters and employees can be counted upon in time of emergency, in spite of the fact that the Pied Piper spends billions to prove that loyalty to industry is to their economic disadvantage.

These myths, like the theory of hellfire, are on the wane. Gratifying indeed is the fact that leaders in industry are looking objectively and realistically at the situation facing them. Employees, too, are becoming more alert. Voluntary cooperation in worthwhile movements is evidenced on every hand, and many an administrator of rank is proving anew that courage is not dead and the will to work and achieve is still strong.

In an effort to accelerate this movement which top executives have adopted and bring incentive to the rank and file of industry, suggestions are now in order. These suggestions are listed as to importance and as they appeal to the writer who for many years has watched the effects of the Pied Piper's lute.

First, we suggest that industry assume a more cooperative attitude toward government, and cease throwing mental stones at a great institution which industry itself helped to create. A change in administration will not eliminate the social and economic trends toward correcting unemployment, caring for old age, giving security and new comforts to the masses. Any government which serves the people to these ends will be desired by the people. And here, incidentally, the Pied Piper teaches us his first lesson. It is this: Industry can seize upon these same mass needs and, with her vast resources and skills, play not only the Piper's tune, but a lasting and useful symphony.

Second, avoid the heavy present drain of customers into the ranks of discontent by correcting customer grievances—high rates, alleged high-handed procedure, the ridiculous bugaboo called "Wall Street," unsatisfactory service, and the too-prevalent belief that state control of power is inevitable. Industry knows what it wants by way of cooperative arrangement with government dams, but the public does not know. An intensive program should be launched to inform the public of a workable arrangement. Often when the public votes for a public power bill, it is in the absence of something better which should have been proposed by industry. Some of the items of discontent can be corrected by change of policy. Other items require a complete information program.

Huge government dams costing the taxpayers hundreds of millions of dollars, and promoted partly for purposes of irrigation and flood control, now bedeck our landscape. They cannot be blown into kingdom come. Regardless of whether people accept or reject the theory of these projects, common sense now demands that these dams be put to the best possible use.

Third, rather than cast veiled innuendos and aspersions at government in general, industry can well afford to adopt a new bomb sight which will disorganize the highly intelligent and highly aggressive minority group of political racketeers. This is not being disloyal to our fighting forces or to government. In carrying out such a program to build prejudice against radical elements which can never be expected to give society the benefits it promises them, industry will have the support of millions of people in government positions, in labor and in management. *If we must carry resentment, let us focus it where it will do some good.*

Fourth, because it is axiomatic that people ally themselves with any organization or cause that promises them greater advantages, the industry must turn to the future and point out more benefits than are offered by government. Management may now begin to "ride herd" on department heads, preparing and planning for the future. A five-year program of consumer benefits should now be announced. It is not to be supposed that government, with only a small per cent of the national wealth collected in the form of taxes, can play a more enticing tune than can industry, which possesses a major per cent of the nation's wealth. Industry, however, must announce consumer benefits yet to come. What standards of living will be ours tomorrow? What will tomorow's home look like? What about rate objectives? What of new services and inventions now waiting in our laboratories? What about specific indirect benefits industry can and should give to the community it serves? Here again, the Pied Piper teaches us that, when dealing with the public, honey is sweeter than vinegar, action more potent than indifference. What's more, a positive program will solve many a problem of employee morale, for wrapped up in such a program are incentives of every kind.

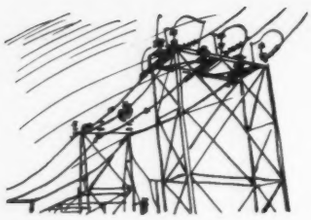
Fifth, industry should make a thorough study of the employee situation.

Here, may we suggest that industry look realistically at advertising and not expect rabbits to be pulled out of the advertising man's hat. The most potent force in persuading men to action is personal contact, preferably one man at a time. Group contact is next to be desired. A competent speaker can do more to sway a crowd under present conditions than can a dozen advertisements. Industry should do something about it.

Again, the news story and magazine article are more to be desired than advertising in molding public opinion, because it wings free from the taint of propaganda. If our advertising agencies are properly compensated, they may modify a threadbare commission theory which forces allegiance to advertising, and give proper consideration to publicity in all its forms. Truly, it is a reflection upon industry that its romantic story is so drably told that industry must buy space in which to tell it. The Pied Piper is more resourceful. Nor is there reason why national prose writers, ingenious fellows with pen and paper, can not be found to tell industry's story in hundreds of magazines even more effectively than government recites its achievements. Every day incidents occur which may be dramatized, if there is but the will to do it.

Finally, as advertising moves into position, we plead for a larger advertising budget which will continue present use of newspaper advertising, and which will also make possible the adequate use of that emotional field, radio. Improved service policies, future customer benefits, prompt service to the mine or the chicken coop, specific community helps, and a novel excursion into the field of prejudice make excellent subject matter for institutional copy.

The Pied Piper teaches us that there is a job to be done. Our own security tells us that now is the time to do it.



MANPOWER—MOTIVE POWER

An Engineering Symposium

WHEN a wartime business conference was substituted this year for the customary conclave, the Engineering and Operation Section of the Northwest Electric Light and Power Assn. devised a new type of program treatment. Round-table discussions took the place of formal presentations. Some of the subject matter was "off the record." Much was vital to everyone in the electrical industry. The group meetings were small and hence distribution of the findings of the discussion limited. Berkeley Snow, association executive secretary, recorded notes. The following symposium discussions on three vital questions confronting the industry have been prepared from these notes.

QUESTION: What modifications have been made in the operating of utility automotive equipment to conform to regulations of the Office of Defense Transportation?

C. P. OSBORNE—Portland General Electric has 170 cars and trucks; 22 cars and trucks are equipped with two-way radio; 7 have one-way radio. We list these radio-equipped trucks with department heads for emergencies—snow, sleet, etc. Certain ones in our operating department know where these trucks are all the time. This saves a lot of car mileage in dispatching trucks to emergencies.

A. L. POLLARD—All emergency cars and trucks of Puget Sound Power & Light Co. have been placed under the supervision of a director of transportation.

LEN RUECKER—We are trying to meet all the rules and regulations laid down by the ODT covering truck operations, but we can't get clear-cut rulings in every case. For instance, we haven't a ruling to determine whether we can use cars for meter reading. We are now reading quarterly in rural territory with post card readings in the interim.

Sales representatives are not using cars, except the farm service men whose job it is to help the farmer produce more food. We are not using cars for collections. When company people travel between divisions, they use the public transportation system.

We listed our trucks and cars according to use. The gas ration board wanted to cut our use 25%. We made some gas-saving by leaving some of the heaviest tools off some of our trucks, thus cutting the dead weight.

We have had no trouble in getting recaps and tubes. The ration board has granted all our applications to date. In these applications, you are required to give the number of tires you own including spares. We have a number of different tire sizes in use so that we need more spares than generally appears to be necessary from looking at the figures given in one of these applications. We turned back over 200 spare tires to the government.

For purchasing gas, we assign coupon books to the trucks on the road. The other trucks draw out of the central gas supply on bulk coupons. We made one application for gas for all trucks, one for passenger cars and one for cars operating on the highways outside Seattle. Our gasoline allocation is interchangeable as to trucks, is not assigned to particular ones.

A. L. POLLARD—When rationing was proposed, we made a survey of all our automotive equipment. We are now making a second survey of our trucks to see what they are actually being used for. We want to get the right piece of equipment in the right place, and we want to find out if any piece of our automotive equipment should be considered surplus. We applied for gas on the basis of the need of our trucks in mileage as indicated by our survey. We figured 10 miles per gallon, and then calculated the amount of gas it would take to run our trucks the indicated mileage.

H. M. JONES—Idaho Power Co. applied for gas for its passenger fleet in two ways: (1) A certain number of coupon books, and (2) a certain volume of bulk gallonage. We did the

Around the Table

M. T. Crawford, *chief engineer, Puget Sound Power & Light Co., chairman, Engineering and Operation Section, Northwest Electric Light & Power Assn.*

H. M. Jones, *electric superintendent, Idaho Power Co.*

L. A. Morphey, *assistant superintendent of power, Pacific Power & Light Co.*

George Rideout, *personnel division, Puget Sound Power & Light Co.*

C. P. Osborne, *general superintendent, Portland General Electric Co.*

A. L. Pollard, *general superintendent, Puget Sound Power & Light Co.*

O. L. LeFever, *general superintendent, Northwestern Electric Co.*

Richard McKay, *assistant general manager, Washington Water Power Co.*

Corbett McLean, *assistant engineer, Northwestern Electric Co.*

Louis Matter, *personnel division, Puget Sound Power & Light Co.*

Alexander Maxwell, *Edison Electric Institute.*

Leonard Ruecker, *director of transportation, Puget Sound Power & Light Co.*

Paul Ashworth, *general manager and chief engineer, Telluride Power Co.*

A. Vilstrup, *assistant chief engineer, British Columbia Electric Railway Co.*

C. F. Myers, *engineer, Puget Sound Power & Light Co.*

Joe Hellenthal, *engineer, Puget Sound Power & Light Co.*

Lee Cook, *Ebasco Services.*

B. F. Lenz, *division engineer, Eastern Oregon Light & Power Co.*

John Bankus, *chief engineer, Portland General Electric Co.*

Henry Berk, *chief engineer, West Coast Power Co.*

R. J. Davidson, *distribution engineer, Pacific Power & Light Co.*

L. R. Gamble, *superintendent of distribution and transmission, Washington Water Power Co.*

S. C. Lindsay, *associate engineer, Puget Sound Power & Light Co.*

—MATERIAL CONSERVATION

by Northwest Utility Men

same with trucks. We understand we can supply any of our fleet from this bulk gallonage, but that each car out on the road must carry its own book to take care of its needs.

LEN RUECKER—We have not applied for gas for employees' cars, nor do we try to help them get tires. This is up to the employee. If an employee's car is used on company business, we pay him mileage on it, but the employee is not obligated to use his car for company business.

RICHARD MCKAY—It is my understanding that we have to have individual gas applications for our passenger fleet, but that, in the case of trucks, we have interchangeability within groups of trucks grouped according to location or use. When we got in the war, we knew there was a shortage of rubber and that it would be difficult to get tires, especially for passenger cars, so we transferred our essential operations performed by passenger cars to light trucks. In this process, we laid up some 80 cars, some of which we have sold since. Of course, we turned in all our tires that were not mounted, but this gave us spares for all cars whether they were in constant use or not.

We have cut out all non-essential use of cars and, by reading meters quarterly, have cut a great deal of mileage formerly used in this occupation. We have also discontinued the practice of permitting our service men out on cut-off notices to accept payment. That policy simply led people to disregard the notice until the men came out to cut them off, and it tended to make automobile-equipped collectors out of our service men. This saved considerable mileage. We also saved the mileage of four cars when we discontinued taking final readings.

C. P. OSBORNE—We don't carry any stickers on any of our group cars. We are allowed so much gas a month and this is bought on requisition. When it is gone, we are through.

PAUL ASHWORTH—We bought a dozen bicycles and are using them for service work and meter reading. We also use some horses in mountainous country. We have employed some local collectors out in the country rather than having collectors work out of the central office. We haven't read any meters in these areas since June. If we don't get a card back, we estimate the bill. When our men are in that territory, they spot check a number of meter readings. In such checks, we have found no diversion of current and no jumpers.

CORBETT MCLEAN — Northwestern Electric Co. is using both B and C stickers on passenger cars. We have adopted a number of schemes for saving mileage. We are arranging with Portland General Electric Co. for transfer of service work between service crews. We read city meters on foot, using the public transportation system to get to outlying sections of the city. We keep a careful record of car mileage, and found we had been able to reduce the miles traveled in December 1942, as compared to December 1941, as follows:

	MILEAGE		
Trucks and Cars	*Dec. 1941*	*Dec. 1942*	*% Decrease*
Under 1 ton....	32,237	21,127	34
1 to 2 ton.....	5,470	5,074	7
2½ to 4 ton....	1,816	1,310	28
Passenger cars..	22,356	8,934	60
Total	61,879	36,445	41

H. M. JONES—By proper analysis and careful operation, we have reduced our mileage traveled by automotive equipment by one-quarter of a million miles. This has necessitated storing some of our passenger cars and trucks.

C. P. OSBORNE—We used 3,000 gal. less gas in 1942 than in 1941.

QUESTION: How has the war affected the manpower situation in the electric utilities, particularly as regards trained operating personnel?

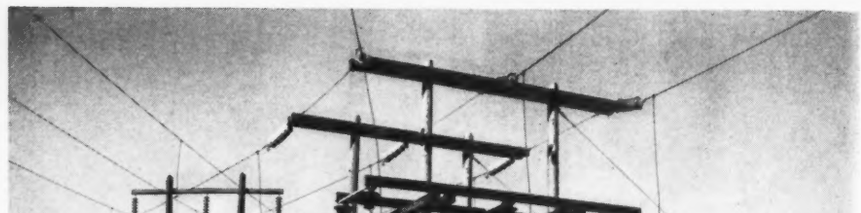
H. M. JONES — In 1942 Idaho Power Co. lost 157 men, 55 to the armed services and the rest to some war industry, government project, air base construction job, or Jap camp construction. We haven't yet lost men who have seriously handicapped us in the operation of the business. There is not so much high-pay work in our territory to take our men away from us as there is on the Coast. We have not been forced to employ women for meter reading, and we have had to ask for very few deferments.

L. A. MORPHEY—I am concerned with the men in the plants rather than line crews. We've had more trouble getting men for steam plant operation than hydro men. We have had to train a number of men in the fundamentals of electric operation and this training has of necessity been quite elementary. We teach them to open certain switches when certain things happen, without their knowing exactly why. We have had to hire some older men. We have also hired two women who were wives of operators, making them substation attendants. They have proved satisfactory. We have not asked any deferment unless the men are irreplaceable. We have not asked deferment on linemen or station operators.

GEORGE RIDEOUT — Puget Sound Power & Light has set up a three-month training course and put into it men from certain non-essential occupations within the company such as meter readers, collectors, etc. We gave them the fundamentals of electricity for three weeks, then had the class split and go into various plants or into maintenance work for two weeks. Then we brought them back to the classroom for special instruction and finally sent them out to the departments where they are to be employed. We also set up another course for stenographers and office girls. We lost 1,550 employees out of 2,600 in 1942.

M. T. CRAWFORD—We have tried out many expedients. In the drafting room, we took a middle-aged sign writer and in a short time made a good draftsman of him. We have also used women in the drafting room. Many of our engineers have received offers from the shipyards and other war industries, and we are trying to forestall this by taking it up with the Manpower Commission on the ground that our work is just as essential as these other industries.

C. P. OSBORNE—In Portland, the unions and the company have set up a nine-week course called an appren-



Washington Water Power Co. saved critical materials at this station by use of cedar pole and fire timber construction. The installation consists of a 110-kv. oil circuit breaker with disconnecting switches. Six by eight inch fir timbers were used in the structure

ticeship school. The school is doing a good job. We have increased our low-paid men's wages on the grounds of higher living costs. This is, of course, to forestall their leaving for higher-pay jobs. We haven't asked deferments, but we may come to it. We have contemplated going to a six-day week with time and a half for the sixth day. This will cut 15 men from the pay roll of our big steam plant, thus releasing these men for other work in the company or other jobs.

A. L. POLLARD—We have up-graded a number of men in line work. We now have a six-month apprentice system in operation which is set up in agreement with the unions. The educational program explained by Mr. Rideout has been a great help to us.

O. L. LEFEVER—We have also up-graded some of our linemen. Fortunately we are not doing much construction or we would be in worse trouble than we are. We have not used women for mechanical work. We have put them in some office jobs, however, where we used to use men. We are using women meter readers except in the more difficult districts. We have had over a 100% turn-over at our Lincoln St. steam station in six months, mostly in the low-pay classifications.

RICHARD MCKAY—The Washington Water Power Co. is going on a three-month meter reading basis in rural territory. In the interim we either estimate bills or get post card readings from the customer. Although this quarterly reading is now used only in rural territory, we have filed so that we can use it in any place where automobiles are used for reading meters. The idea is to curtail the use of rubber, to save automobile costs and to be prepared to get along with a minimum of men. When we put it into effect six months ago, the manpower problem was not acute. We are on a fairly good basis for manpower now. We have absorbed some sales people in our operating departments. We have lost a number of men to the Army and Navy but not so very many to the war industries. We have asked for deferment only on key men. We seem to have a pretty good backlog of labor supply now.

CORBETT MCLEAN—We are reading meters only every six months now in Clark County, Wash., where the company serves a large rural territory, using card readings for the interim bills. We are not turning off meters on final bills, nor are we reading these. We estimate final bills.

RICHARD MCKAY—We have not turned off meters for a number of years. Now we are estimating final bills, which not only saves rubber and manpower, but it is a means of getting your money at the time the cut-off order is given.

H. M. JONES—The REA has used post card billings since its inception. This has had its effect on some of our districts where people seem to think we should use the system for economy reasons.

GEORGE RIDEOUT—We are planning to take care of the men who have gone from our company to the armed services when they get back. We have a clause in our application for work now that states new employees are hired only for the duration.

ALEXANDER MAXWELL—Boston Edison Co. uses women as substation operators. They have manned some of the stations entirely with women. One of the American Gas & Electric Co. properties is using women in its steam stations on regular-shift jobs along with men. The women are given only the lighter jobs.

GEORGE RIDEOUT—We have used women in our garages as garage attendants and for office work. They do car washing, greasing, gasing, etc.

ALEXANDER MAXWELL—The bottleneck now seems to be in materials and not manpower. There are a number of construction projects on now throughout the country, which, when completed, will throw men back into the general labor market. Therefore, I think we may expect a little easing up of the labor shortage created by war industry. We will, however, continue to have inroads on our workers from the operation of the Selective Service Act. The companies in the East now think that it is the patriotic thing to do to ask deferment on their essential men in order to keep plants and systems running at full capacity and efficiency.

LOUIS MATTER—Our company has commenced an analysis of our personnel with the idea of filing deferments on all key men. We have a card file of every man showing his date of birth, draft classification, job classification and all essential data, indicating whether his occupation with us is critical or not. We are filing a deferment on every one of the men in these critical job classifications. We expect the draft to take all single men and all married men without children. We are now going to check our men from dependency standpoint so as to be ready for any new regulations with regard to drafting men with dependents. Draft boards have been quite fair. They didn't all interpret job classifications the same, but we have had pretty good success with them. These deferment requests are based entirely on the job. We do not consult the men.

GEORGE RIDEOUT—We were told not to confer with the men. This is a matter between the employer and Uncle Sam, saying that this man is more important to the war program in our work than in the armed services. There was a variation among draft boards in the interpretation of jobs, but this is being straightened out. You should file deferments only on the number of men you actually need for a particular line of work, or department, or division of work.

LOUIS MATTER—Deferment applications are a help to the draft boards. It helps the boards to keep abreast of their work, helps them to be forehanded so that they won't get caught short. The boards reclassify their men on receipt of our applications.

A. VILSTRUP—In Canada, we have three classifications of jobs: (1) Those that are irreplaceable; (2) those that can be replaced in time; (3) those that are replaceable at once. Each utility has given the central board a listing of all its men grouped into these classifications.

M. T. CRAWFORD—It is the obligation of the company to try to get deferment on all its key men, all its important men, and it is also our obligation to train men for key jobs.

QUESTION: How have engineers and operating men devised substitute techniques or applied substitute materials to meet the critical material shortage?

M. T. CRAWFORD—The idea in discussing this subject is to develop company experience not only in the substitution of materials but in any ingenious devices that have been adopted to save critical materials.

C. F. MYERS—Puget Sound Power & Light Co. has found creosote-dipped fir crossarm braces to be stronger than the steel braces formerly used. We use wooden guy guards, tying them on the guy wire with two short pieces of scrap wire. We have tried concrete anchors in place of malleable iron expansion anchors. The concrete anchors are conical in shape, lightly reinforced. They cost more than the regular anchors but they save metal.

We have used iron wire conductors only on lightly loaded primary lines. We are using 5/16-in. guy wire for conductors on a four or five-mile stretch of 55,000-volt line.

Our crossarm specifications have been changed to permit our using a lower grade of fir lumber because of the shortage of the better grade. In the underground system we are using iron core reactors to save transformers in our network. These reactors balance the load on two unequally loaded transformers in a vault.

We are building substation structures of wood instead of steel—even the more important ones. We are reducing the steel reinforcing in concrete slabs, in some cases using scrap iron. Formerly we installed a number of disconnecting switches, largely for convenience, around lightning arresters, potheads and other items of equipment. We are now eliminating some of these.

We are now using some equipment formerly considered obsolete. Sometimes it is necessary to adapt these to present-day conditions. For example, we had on hand a bank of 4-kv., three-phase to 2,200-volt, two-phase autotransformers. We changed these to 2,300 volt, single phase by using taps.

We are now loading lines and substations more heavily than before. Our primary network system saves a lot of equipment and critical metal, chiefly copper.

We are installing a factory-built substation which will save material though it was purchased originally with the idea of presenting a good appearance in a residential area.

JOE HELLENTHAL—Our wood substations are planned with the view to replacing them with steel when the wood wears out. They are designed so that steel members can be placed without taking out the wood structure till after the steel is up.

LEE COOK—The EEI has two specifications for crossarms: (A) designed for clearance, (B) designed primarily for structural reasons to use a lower grade of lumber. I am wondering which the companies are using.

M. T. CRAWFORD—We are using the B specification because material for the A is not obtainable. Is anyone using hemlock for crossarms?

B. F. LENTZ—We have used some and found it strong enough but it warped.

JOHN BANKUS—We have tried some "wolmanized" arms but, when these are treated before the wood is fully dry, they get "hot" and the linemen object to them.

M. T. CRAWFORD—We have used some cedar arms and found them all right for tight lines.

HENRY BERK—West Coast Power Co. had a line partly completed when the WPB stopped construction, saying that we could go ahead on it if we could get steel wire from another utility. We had the copper on hand but the WPB wanted this copper conserved. We acquired the steel conductor and went ahead. The line was only 1½ miles long. We are salvaging a number of 11-kv. and 2,300-volt transformers for use in other places by changing over some of our lines to higher voltage.

R. J. DAVIDSON—We found a number of harrow plates among the scrap on farms when we were in the scrap drive. The company donated trucks to pick up this scrap and took these harrow plates in return for the use of the trucks. We are using them for guy anchors. We are doing more stubbing to save poles.

We have used some iron wire for conductors, finding 3/8-in. guy wire suitable for primary in some instances. We find that Siemens-Martin steel has better carrying capacity.

We have rewound a number of transformers to change the voltage, generally only the secondary winding. We have also loaded transformers to higher limits.

The term "mobile unit" is quite likely to refer to bicycles in these days of rubber and gasoline shortages. This fleet belongs to Pacific Power & Light Co. and is in service at Walla Walla, Wash. Similar units are being utilized by most of the northwest utilities

We have used all kinds of wire for distribution systems. Most of these substitutes are not ingenious. It is just a matter of making use of what we have on hand.

L. R. GAMBLE—The Washington Water Power Co. has used harrow discs for guy anchors for some time—even before the war—as a matter of economy. We have tried concrete anchors of the cone type or log type. They cost more than metal anchors. We have also used a number of obsolete transformers by adapting them to present needs. They have come in very handy. We have loaded equipment up to the limit. For instance, we have put 20,000 kw. on a 15,000-kw. bank of transformers. It is necessary, however, to watch the temperatures closely. Sometimes we put in auxiliary cooling and have generally found water best. We can get another degree or so reduction in temperature by water and air together. We would have considered this poor practice a few years ago.

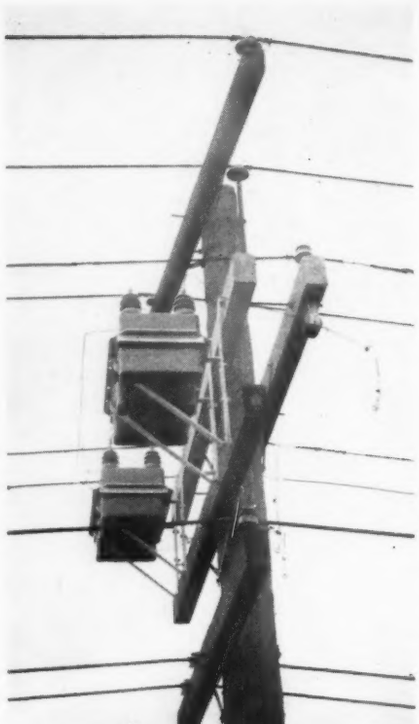
We have used wood foundations for wood substations, sometimes using creosoted ties as we did 20 years ago. Wood above ground east of the mountains lasts a long time, from 40 to 50 years, so we don't worry about it. We haven't considered that we will need to replace these with steel.

We have converted water-cooled transformers to air-cooled. We have put a small radiator on the case and got enough radiation to do the job. We have also tried oil pumping.

S. C. LINDSAY—In our salvage shop, we have an electrolytic galvanizing plant. One of its requirements is a high-purity zinc. We found scrap meter cases to contain a high-grade zinc. We melted these and are using this metal in our galvanizing.

We have developed a press device to use on poles for splicing instead of using 30-in. splicing sleeves. It is a small hydraulic press. It is quicker and better for splicing aluminum.

JOHN BANKUS—In recent years we have been building substation structures of steel. Since Pearl Harbor, however, we have built nothing but wood. The members are trussed and prefabricated and installed like steel. This didn't save us any money but it did save metal. We have converted some indoor potential transformers to outdoor type. Networking is promising for the future. We may not be compelled to do it for saving metals, but we want to do it for economy.



Series capacitors are helping northwest utilities to release required generating capacity. In this installation on the Northwestern Electric system an extra crossarm position was saved by hanging the units on primary arm

A. VILSTRUP—Power factor correction also saves material. We started making this correction as an economy measure but it now is advantageous from the standpoint of saving critical material. We have a rating from our metals controller in Canada for the manufacture and installation of 6,000 kva. of capacitors and expect to get more.

CORBETT MCLEAN — Northwestern Electric Co. is also installing series capacitors. They are protected against shorts and line trouble by relays installed in socket-type, watthour meter cases which, together with protective film cut-outs, are mounted on the side of the capacitor case.

We have installed some No. 10 service wire for ranges and lights and two No. 8s and one No. 10 for range, lights and water heater. We have loaded residential transformers for short peaks up to 200%.

We have used silver contacts on switches and silver inserts on contact fingers. We have also done some silver plating of the contacts of primary cut-outs. By this means we have salvaged burned out switches and obsolete equipment and have increased the capacity of our switches. We have also shortened substation buses.

Portland General Electric Co. uses radio-equipped cars and trucks to cut down mileage, facilitate service

PLANT PROTECTION

Review of safeguards occasioned by war

GEORGE A. HUNT
Pacific Gas and Electric Co.

PCEA War Conference report by the Operating Economies Section

Two of the 60 armed guards detailed to guard San Diego Gas & Electric Co. property soon after Pearl Harbor. Army troops are not now available to protect privately-owned utility property

PROTECTION of strategic plants and facilities from injury or destruction by sabotage is one of the vexing problems imposed on public utility management by the war emergency. Prior to Dec. 7, 1941, private industries engaged in producing material and equipment under the national defense emergency program found it necessary to establish and maintain carefully planned guard systems to minimize the possibilities of sabotage. Certain protective measures were required of both the manufacturers having defense contracts and the utilities serving them. After Pearl Harbor these industries, coming under the war program, had to extend their guard systems and coordinate them with suggestions of the War Department and other federal agencies.

Municipal and private public utilities had given very little consideration to the menace of organized sabotage, which could cripple transportation, communication, electric power, gas and water supply facilities. As widespread sabotage is usually thought of as an enemy war measure, the utilities considered that the Army was more or less responsible for their protection. The Office of Civilian Defense had been created, however, and its local units had done considerable basic planning under federal guidance so that, at the outbreak of actual hostilities, some measure of protection was promptly established to cover the most vital public works. This initial guarding was accomplished by emergency forces furnished by the Army or by the state, by personnel recruited by local sheriffs and police, and even by volunteer groups of Legionnaires and other such organizations.

During the period of initial hysteria plans for guarding individual facilities were based on widely divergent opinions of various agencies and, as a result, varied from the mere locking up of buildings or the employment of gatemen to a completely fortified installation with barbed wire fences, sandbagging, flood lighting, bullet-proof machine gun towers, etc. Among the utilities there was, and still is, quite a divergence of opinion in respect to the extent and nature of the protection that should be provided. The utilities have been offered much advice by dozens of bureaus, departments and public agencies, none of which, however, have had legal authority to dictate how an individual company should handle its guard problem. The conflict in recommendations and "orders" from these agencies added to the confusion in the minds of management as to what really should be done.

At the present time, however, federal agencies under proper jurisdiction are supervising the internal security of our communication, transportation, gas and electric utility systems. The water supply systems of California are under study by federal and state agencies for the purpose of establishing conservative and coordinated plans to safeguard the interests of the war industries and of the general public.

Supervision of the protection of industries vital to the war program in California, and of the utilities directly serving them, is now the responsibility of the Commanding General, Ninth Service Command, administered in this area through the Plant Inspection Sections of the Internal Security District offices of the Army.

The Army program, which to a certain degree militarizes the private guard system of industry coming under its jurisdiction, is tersely expressed in the following excerpt from Circular No. 15 issued March 17, 1943, by Headquarters of the Army Service Forces:

"*Purpose of Military Organization* —To establish and maintain military guards and patrols, and to take other appropriate measures, to protect from injury and destruction certain strategic premises, materials, and utilities. Accordingly, the Secretary of War directed the military organization of plant guard forces as Auxiliary Military Police. The purpose is to increase the authority, efficiency, and responsibility of guard forces at plants important to the prosecution of the war and through military training to provide auxiliary military forces throughout the United States to supplement the Army in wartime emergency situations.

"*Mission of the Auxiliary Military Police*—

"Sub-Par. (a)—The mission of the guard forces of Auxiliary Military Police is (1) to provide internal and external protection of the plant against sabotage, espionage, and natural hazards. 2. To serve with the Army in providing protection to plant and its environments in emergency situations.

"Sub-Par. (b)—An emergency situation in which the Auxiliary Military Police may be called upon for military service may arise from flood, conflagration or other disaster; internal disorders, hazards to property or production important to the prosecution of the war; enemy action by air raid; fifth column activity; paratroop attack or invasion; or it may arise from any other condition or circumstance involving the plant or its community, making it necessary to place in opera-

tion one or more of the emergency plans of the War Department or of the Service Command."

Planning for the protection of the scattered facilities of a modern utility must take into consideration the location and accessibility of each plant, the extent of the physical protection that can be economically provided and the number of human guards that are necessary. Where human guards are needed, a complete program for the selection, training, uniforming and arming of guard personnel and for the method of their utilization and control must be established.

Regular army troops or state guardsmen are not available for the protection of privately-owned utilities. The small force, now detailed from these sources to guard facilities in California, is confined to the protection of certain railroad structures and major municipal water works. It is probably but a question of time when even this small force will be withdrawn. Thus the protection of important project works will of necessity be maintained by private guards, under federal supervision but paid for by the companies or agencies owning the respective works.

The protection provided and paid for by private utilities will differ from the type and scope of guarding that would be expected if federal or state forces were available. It would be impracticable for any utility to maintain at any plant the number of guards adequate to resist an organized band of determined saboteurs. The best that can be done, and all that seems to be justifiable, is a "watchman" system to prevent damage to a plant or facility by one or two persons operating on their own initiative with intent to do some local damage. A watchful armed guard will usually keep such a person or persons from taking the personal risk of a sabotage attempt and will be of value in protecting a plant from natural hazards, such as fire.

Although the Army has taken over the jurisdiction of plant protection it has not as yet undertaken to dictate which utility plants should be protected. It still rests with the utility management to make the decisions as to which of its works should be protected and to determine the extent and type of protection desired. The economic aspect, that is the amount of money a company can afford to spend for protection, will generally govern the scope of the protection that can be provided. On an extensive system, this aspect will limit the number of structures or facilities to be guarded to those most essential in the maintenance of continuous service. All important structures, works and facilities of the utility must, therefore, be individually classified. Each unit should be given a priority based on its importance and vulnerability from both a local and system-wide standpoint in relation to other units of the system. In rating its various works the utility must give special weight to the units that are directly involved and essential in the supply of power to industry vital to the war effort. The importance of an individual unit will also depend on the alternate sources of supply that are available or could economically be provided to fulfill the function of that unit in the event it should be put out of service for any extended period of time.

Having been so rated the facilities selected for special treatment must be individually analyzed to determine the most effective and economic means for their protection. Consideration should be given first to permanent or semi-permanent physical measures that could be effectively applied to deny access to the plant by any unauthorized persons and to protect it against damage from nearby areas. Such physical protection should include fencing, locked gates, sandbagging, splinter-proof windows, clearing and illumination of adjacent area, etc. Much of this type of protection has permanent plant value, and can be justified in capital account. It is generally advantageous to expend money and effort along this line to minimize labor costs and the use of manpower, especially since the protection of strategic works may be necessary for several years to come.

At plants where properly trained and alert company employees are on duty at all times, the addition of physical protection, without the employment of human guards, will often be sufficient. At more important plants gatemen may be added to augment the normal protection afforded by fencing and alert employees. At the most vital and vulnerable plants it may be necessary to maintain armed guards, usually to cover the period from 4 p.m. to 8 a.m. on a two eight-hour shift basis or on a full 24-hour basis. A single guard station, operated on a 24-hour basis with three eight-hour shifts will require 1.4 men per shift or 4.2 men for a 40-hour week. By reason of the 40-hour week situation and to allow for absences of personnel on account of sickness or other unavoidable causes, either overtime must be paid or an extra, or relief, man provided for on the pay roll to maintain continuous protection. The Army's new program, requiring training of guards through the medium of periodic classes under the jurisdiction of the Plant Protection Service, adds a further problem in the preparation and maintenance of proper work schedules.

The corps of guards employed by a utility should comprise only carefully selected personnel, picked as far as practicable from experienced company employees. Guards must be physically fit and intelligent, and must have such mental capacity and personal attributes as to be fully fitted for this particular class of work. Guards should be uniformed and armed. They must be individually instructed in the performance of their general and specific duties, to the point where they can take care of themselves and intelligently handle any emergency that may arise in connection with their assignments. To accomplish this a guard manual should be made up and each guard required to familiarize himself with its contents. This is essential to take care of new employees prior to and during their military police training. Some classroom work and a periodic written questionnaire system also are desirable. Even though the guards on a utility system may be sworn in as Auxiliary Military Police under the Army program, the utility may desire, and is entitled, to have its guards also deputized in the local police or sheriff's forces.

To supplement the protection afforded by armed guards at fixed stations and to cover the scattered facilities necessarily left unguarded, a large number of key employees should be deputized and charged with the duty of watching over company property in addition to their regular company work. Superintendents, foremen, linemen, groundmen, field representatives, lake tenders, canal agents, etc., are all natural "watchmen" or patrolmen, and when deputized and instructed are a valuable addition to a guard system.

The control of the guards should be separate and distinct from normal company operating routine. Although the responsibilities of plant operators and the guards detailed to protect a given plant should be carefully coordinated, the responsibilities of each should be clearly defined. On a large system the immediate guard control and inspection system should be territorially decentralized. The chain of authority, heading in the managerial department, in respect to direct control of the guards should be rigidly adhered to. To be effective on their job and to justify their employment the guards must be given explicit authority, which authority must be respected by all employees of the company from president to office boy.

Guardians of the HOME FRONT

An "Eyewitness" Report to the Electrical Industry by the editors of Electrical West

SOME go to battle. Others must stand guard. Of the two who can say which is more important? All of you on the Home Front today will understand that question.

The risk, the personal loss is often greater in battle. But so is its thrill, its adventure. This is a compensation denied those who plug away at home. Yet what is worth fighting for is worth guarding, even if guardianship may earn no medals, nor Army and Navy "E," no recognition, even little appreciation.

Yet appreciation rewards the faithful who stand guard even as medals do those who risk all in battle. This is a report, in telegraphic terseness, as to how some of the guardians of the Home Front stand inspection. It is a record which in modesty no soldier may say of himself. But it is one of which his companions may well be proud for him.

Will business and industry get its job back when this is all over? Surely it is no more wrong for a business to ask this question than for a soldier about his job as he goes off to war. For like the men of each community, the business and industry of that community has been called to war too. Victory will require not only fighting men, planes, ships, tanks and guns but it demands war workers, producers of materiel, farmers.

Back of them all there must be guardians of the Home Front. As the others forsake their jobs and businesses in the name of Victory, they ask that these guardians hold firm to those things which will make the fight worth while. In our own electrical industry, this is what has happened generally:

Manufacturers who used to make electrical materials, supplies, equipment and appliances have converted their plant and personnel to war production. When it can be told, the story of that mobilization will make thrilling industrial history.

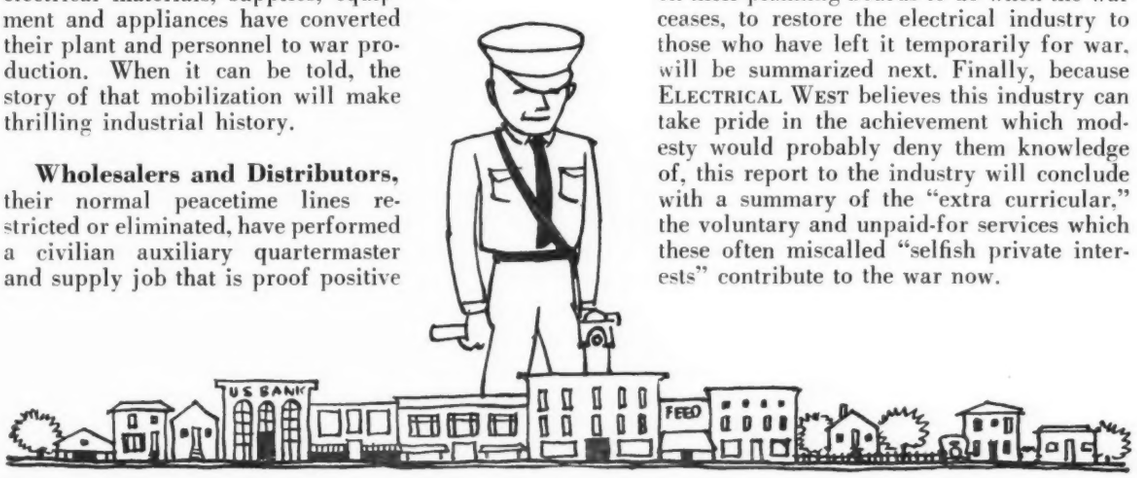
Wholesalers and Distributors, their normal peacetime lines restricted or eliminated, have performed a civilian auxiliary quartermaster and supply job that is proof positive of their vital function in the distribution of goods, whether for peace or war.

Dealers too, have contributed their experience and commercial knowledge to war agencies, to war production, or have diverted their businesses from familiar channel into others useful to wartime civilian needs.

Contractors have erected the myriad of camps, cantonments, posts, war production factories and facilities for the pursuit of the war. Many have given up their own businesses to work with the tools, first in aid of this gigantic construction program, and then later in war plants or in shipyards.

Utilities have had a double duty. First they have diverted facilities and personnel to serve the phenomenal war loads suddenly dropped upon them by war factories, camps and military establishments in their territories. Uniquely they have a second duty—the home front to serve, to guard, as well. It has been their job to stay at home, with residential and small business customers. And it is upon these utility guards of the home front that the electrical industry, inducted for war, depends to maintain that home front of business until all can come back to serve domestic and peacetime business needs again.

To telescope this report into its tersest wordage, details applicable to any single company may be pooled with those of others. There are 18 business-managed yet largely community-owned utility companies represented. What they are doing now that has a definite value to the electrical industry in the future will be told first. What they have on their planning boards to do when the war ceases, to restore the electrical industry to those who have left it temporarily for war, will be summarized next. Finally, because ELECTRICAL WEST believes this industry can take pride in the achievement which modesty would probably deny them knowledge of, this report to the industry will conclude with a summary of the "extra curricular," the voluntary and unpaid-for services which these often miscalled "selfish private interests" contribute to the war now.



IT is not easy to see a potential long range benefit in a present-day war service. The immediate result is what seems most important now. But for those in a business which has been so converted to war as this electrical industry has, or so diverted into other fields for the duration, it will be reassuring to have some of these wartime jobs interpreted into the language of their future benefit.

In various way ELECTRICAL WEST finds the utilities of the West on guard for the entire industry. The immediate worth of such activities is to be found in their war contribution, of course. But these activities also have after-war values to the entire electrical industry.

These Things They Do—

MAINTAIN THE GOOD NAME OF THE ELECTRICAL APPLIANCES AND EQUIPMENT AND OF THE MANUFACTURERS AND DEALERS WHO MADE AND SOLD THEM, by active aid to provide repair service for those appliances. Such aid is given both to customers and dealers. Customers are given sound advice, by means of advertising, radio, meetings and helpful pamphlets, as to better care and maintenance of their home appliances. They are told how to take care of the petty little jobs, such as cord repairs, yet cautioned to get competent repair service when there is real need.

Directories of repair shops and service stations, and of sources of repair parts have been prepared and made available to dealers and public. Help has been given in the starting of training courses to instruct new service shop personnel. Strong representation has been made to the War Production Board on behalf of these dealers to gain recognition of the urgent need for allocation of sufficient materials to manufacture essential repair parts so that these electrical appliances may be kept serving.

HELPING DEALERS THROUGH THE TANGLED RED TAPE OF REGULATIONS, PRIORITIES, PRICE CEILINGS, FREEZING ORDERS, HOUSING RESTRICTIONS AND THE LIKE. Continued existence of electrical dealers is vitally important to utilities, it is true, but to the dealer continued existence is livelihood itself. Such help has probably saved some dealers. Certainly, it has saved them time spent in study and digestion of countless forms, and perhaps saved others from difficulties which noncompliance would bring.

CREATING GREATER RESPECT FOR ELECTRICAL EQUIPMENT IN THE HOME as a by-product of nutrition and wartime diet cooking classes. Such respect after the war can create wants for the new, the improved models that are sure to emerge.

UPHOLDING THE ELECTRICAL WAY OF LIFE before the public in advertising and public meetings. This is an insurance that the tremendous investment the industry has in this idea will not be allowed to die of malnutrition. This "holding the line" will mean a faster comeback for the industry when merchandise is again available with which to satisfy that ideal.

KEEPING RATES LOW despite the inflationary rise in price of every other commodity and service. This means that the incentive of low operating cost will stimulate the purchase of new equipment when available.

MAKING SURVEYS AND KEEPING DATA on population, saturation of appliances, state of repair, age and probable market for replacement. Similar data are being gathered as to commercial, industrial, lighting and farm electrical equipment. Because utilities have helped so many small local industries to obtain war material subcontracts and thus keep going, these local industries will be friendly to new electrical equipment to reconvert for peacetime manufacture.

FIGHTING FOR THE AMERICAN WAY OF LIFE, of doing business, right in the home field, conscious that if they fall to government regimentation it will not be long before government goes into manufacture and distribution. While all are busy at war tasks someone must continue to fight on the home front to keep America an *opportunity* to come back to, not a concentration camp.

"When the lights come on again, "All over the world—"

Then when the industry and business in general does go back into *business* again, what can be expected from these same utility companies? To that very natural question, ELECTRICAL WEST reports these answers. They are gathered from questionnaires and conversations directed at the men in charge of management and sales, and they are likewise based upon the trends observed in the business during the last preceding years before the war. ELECTRICAL WEST feels that the electrical industry having gone to war—including manufacturers, wholesalers, dealers and contractors—can rely upon its home guard, the utilities, to—

HAVE LOW-COST ELECTRICITY available in abundance for conversion from wartime to peacetime uses. To make this conversion will require electrical equipment, materials and labor that will offer the richest market this industry of phenomenal growth has yet experienced.

HAVE MARKET SURVEYS AND DATA prepared which will be of invaluable assistance to manufacturers, wholesalers, wise contractors and dealers for use in rebuilding their electrical businesses. These data will be broken down into local units and markets so that they may be applied more usefully to each town and trading area. It will be intimate and realistic information, derived from maintained friendly contacts and unfaltering service to the public during its time of strain and stress and "do-without."

PREPARE BY ADVERTISING AND SERVICE throughout the entire crisis. These markets will be ready for cultivation by intelligent local businesses.

ASSIST IN CAMPAIGNS AND PROMOTIONS, sponsor and participate in cooperative organizations, leagues, bureaus and societies for the furtherance of the electrical way of life.

HELP IN OPENING NEW FIELDS for such as television, air conditioning, electronic applications, new devices and appliances that are liberally promised when peace permits the use of materials to better life instead of destroy it.

STIMULATE NEW HOUSING, building and home modernization, new kitchens, new home laundries, new lighting, new offices, new markets and stores, new signs, new street lighting to replace the obnoxious dimout. All of these will mean markets for materials, equipment, appliances, wiring, labor.

The *deeds* of today, while directed now toward the war effort so completely, give such promise for the *tomorrow* after the war that it is eminently worth while that everything be put into the war effort in order to hasten the day. This guardianship of the home front should reassure the electrical industry, indeed all business, that it can entrust its future to these utility companies while it turns its full effort toward winning the war.

We can say it for them

"It's their job." Of course it is. But ELECTRICAL WEST feels that if the business and professional community which the tax-paying, self-supporting, business-managed electric utility companies serve appreciates the size and worth of the job they are doing as good citizens long trained in public service, all will have faith in the survival of business management and free enterprise, come what may. The record proves that business enterprises *do* take on civic responsibilities, handle them efficiently, quickly, modestly, and what really counts in time of war, make a good job of them.

As guardians of the home front, these are the variety of things they are doing directly beneficial to the war effort itself:

IN CIVILIAN DEFENSE, not only are their employees enlisted for maintenance of "utilities," which might be expected of them, but they have set up casualty stations, their girls man the control centers and air raid and warning centers, their employees are nearly all doing some form of air raid warden, auxiliary police, auxiliary fire, first aid, bomb demolition and rescue and air watcher service. Utility employees generously give of their own time as chairmen, coordinators and members of councils and to serve as instructors. Their lighting experts are volunteer light control officers. Their guards are deputized police. The companies have provided auxiliary emergency power, telephone, radio, ambulance, first aid and fire fighting equipment. Their auditoriums are being used for bandaging projects by local women. They are organized for disaster evacuation.

In the protection of their properties, which means insurance of continuous electric service to their communities despite war, the 18 companies of the West have incurred $2,300,000 of extraordinary operating costs to comply with governmental requirements for guards and other measures to prevent sabotage and minimize damage in case of "incidents."

ON BOARDS AND COMMITTEES, which all consume time, utility men and women give generously. They are on selective service boards, ration boards, war bond committees, Red Cross and War Chest drives, USO committees, accident prevention, salvage collection, book and athletic equipment, victory garden committees. Utility women act as hostesses at USO, collect silk hose, sell War Bonds, volunteer as typists for draft and war boards, fill cookie jars, make blood donations, take Red Cross training and double as nurses aides. Others do these things, too, certainly, but the percentage is high in utility volunteers.

When crops need harvesting utility people are to be found helping. Another way in which they have served has been to man Forest Service fire watching posts instead of taking vacations.

SCRAP METALS AND RUBBER totaling a mountain of 30 million pounds has been collected by companies used to salving expensive materials and making them over to use again. This does not include the miles and miles of wire that has been salvaged for reuse, welded together and straightened from unstranding of old cables to be used again.

MILEAGE WAS REDUCED to conserve rubber and gasoline. For companies that were wont to give "fire alarm" speed on service calls this meant asking the cooperation of consumers in order to group service calls and in remote areas even voluntary meter reading. But most companies cut 40% from their auto and truck travel.

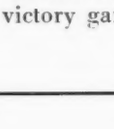
ON DIMOUT AND BLACKOUT, which have both been costly retreats from the well-lighted prewar days, these utilities have ungrudgingly cooperated; indeed have taken the initiative in assisting the public to conform. To the coast utilities conformance meant extensive painting and shielding of street lighting units which numbered into millions of units. It meant extensive installation of street lighting control circuits for quick blackout. It meant close cooperation with traffic officials to maintain the highest permissible street and highway illumination for prevention of accidents.

The lighting engineers and salesmen were loaned to civilian defense organizations to counsel with industries, stores, public officials and householders in methods of dimming out and of provision for total blackout. Education of the public was undertaken in advertising and in pamphlets and public meetings.

LOCAL INDUSTRIES, too, they have helped to salvage and convert to war production. Studying the procedure and keeping on the alert for subcontracts, they have advised their local shops and plants in the procuring of such contracts. They have assisted in the conversion of their existing equipment and the obtaining of essential additional tools. At a time when trained manpower was at a premium the engineering advice in illumination, mechanical and electrical engineering that they gave freely could not have been had for love or money in many instances. Building contractors, architects, commercial and industrial concerns, housing projects and army and navy officers all have benefitted.

FARM SERVICE has been outstanding, for the farm advisory and engineering personnel have pitched in from the beginning to assist farmers to make the Food-for-Victory quotas assigned them. They have helped them find, trade and borrow equipment, they have assisted them with priority applications and in numerous cases peeled off their coats and helped a farmer in distress to get in a crop. To the city home customers they have distributed victory garden information.

Directly for War



EMPLOYEES IN THE ARMED SERVICES, both men and women, from these 18 companies, large and small, total 5,630, or did when this survey was made. The number is larger now. Of the 33,000 people employed in these companies this represents 17% of all employees. It ranges in individual companies from 10% to 33.6% of the employees, but the 10% in the smallest company, which had only 74 employees, represented a serious loss of manpower. In one large utility already eight of the stars are gold stars, men who will return no more.

In all companies regular contact is kept with these boys in some way or another. In some companies the program is extensive, including remembering them with holiday and birthday cards, letters, employee magazines, and all pledge them jobs upon their return.

WAR BOND PURCHASES on regular allotment basis run annually at a rate of $4,380,000, and this does not include independent purchases or bonds bought by the companies themselves.

In addition, financial contributions direct to the war program should include the extraordinary capital expenditures of $3,500,000 to serve military loads exclusively. These expenditures are not reimbursable. They are an outright contribution in service facilities to these camps and posts. In the same general financial phase should also be considered the provision of electrical service for at least 186,000 war housing units in critical housing shortage areas to take care of the influx of population. Much of this, while paid for, represents additional expense which cannot be charged. And in other instances some companies have lost residential customers because of workers moving away to war production centers.

TO SERVE WAR INDUSTRY ITSELF these utilities have been called upon to serve 1,250,000 horsepower of new industrial facilities and have met that tremendous challenge without curtailing power or lighting uses to regular customers. To translate that large figure into terms more easily grasped, such an amount of horsepower is sufficient to serve 75,000 average sized (15 h.p.) farm irrigation pumping plants. Or in still another analogy, enough power for two cities the size of San Francisco, for *all* lighting and power purposes.

POWER POOLS were not new to these companies, for they had long ago interconnected to insure service against the vaguaries of rainfall in one or more regions. Therefore they voluntarily placed these power tools at the disposal of the government and gladly tied in also with municipal and federal power agencies. Likewise in the matter of transformers, wire and equipment they had set up voluntary exchange and purchase mutual aid pools which were turned over to the power branch of the War Production Board as a going concern. Studies have also been made quickly and efficiently for the government, as to power capacities, facilities and potentialities, as well as on orderly means of curtailment if it should ever become necessary.

Some of the top executives of these private companies have likewise been called to serve the nation in foreign relations and other highly special capacities because of their knowledge and experience. In a lesser but very important way company engineers have taught war production training courses at schools and colleges and assisted generously the Training Within Industry program. Army and Navy "E' awards are not given to utility companies, although many army and navy officials have expressed the wish to so reward their contribution to the war effort. Perhaps it is a Civilian "E" that they should be given, "*for extraordinary and meritorious service on the Home Front, both for the communities which they serve and for the electrical industry for which they have been left on guard for the duration of the war.*"

STANDARDIZATION BRINGS ECONOMY

Especially when coupled with repetitive manufacture

S. W. SCARFE
General Electric Co.

PCEA War Conference report by the Operating Economies Section

WHEN, as is the case of us Americans today, a people are engaged in a total and terrible war, the winning of which must be accomplished to save our very lives and liberty, our first thoughts must be as to how best to do our individual jobs in furthering our national cause. We of the electrical industry are accomplishing results which a year or two ago were thought to be impossible, both in furnishing kilowatt-hours and in manufacturing electrical apparatus and supplies. Only two years ago, in the early part of 1941, we were marvelling at the fact that our electrical manufacturing industry, as a whole, was then scheduled to build a billion dollars worth of war materials during that year. Today General Electric alone is producing appreciably more than that amount. It is probably a military secret as to the total volume scheduled to be produced by all of the electrical manufacturers this year; however, you can estimate for yourselves what this total is and in so doing you will appreciate what a big job has been given us to do.

Although the first thoughts of each of us, until the war is won, must be as to how best to do our particular wartime job, certainly our industry should take advantage of lessons being learned now to insure continued progress, not only during the war period. but for the years of peace which are sure to come. Our present discussion is of the economies that can be effected by standardization and repetitive manufacturing of heavy lines of electrical apparatus.

Before the war America was envied by other nations because of the ability of our manufacturers to mass produce such goods as automobiles, refrigerators, electric kitchens, incandescent lamps, and thousands of other things that make our standard of living the highest of all people. By mass manufacturing, on a repetitive basis, of hundreds, thousands or millions of units of the same design, we were producing consumer goods at prices low enough to allow their purchase and enjoyment by all of our citizens. Also, certain lines of small apparatus used by the electric utilities, including such items as watthour meters, distribution transformers, capacitors, and small breakers, because of standardization, were being manufactured on a repetitive basis with resulting low costs. For example, only because they were produced by the tens of thousands, and of the same design, was it possible to buy watthour meters for less than $8.50 a piece.

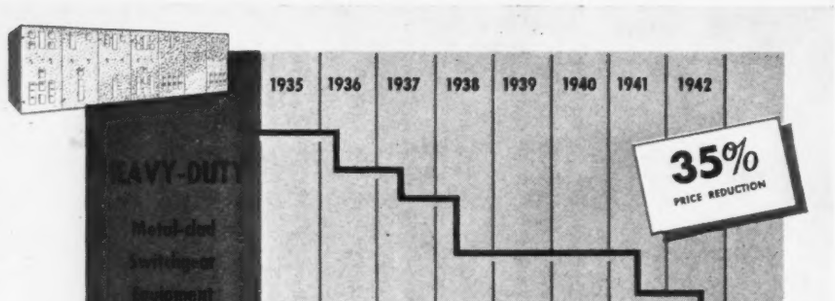
Millions of dollars have been saved the electrical industry by the joint efforts of the utilities and manufacturers to standardize and simplify some of these smaller apparatus lines. But in the field of large or heavy apparatus, such as steam turbines, power transformers, heavy switchgear, etc., we have been far less successful in getting together on any program of simplification, and yet these large units of equipment require a much bigger percentage of the capital investment of the electric utilities. Isn't it time, therefore, to explore this new field for cooperation?

We might ask ourselves questions as to what has held back simplification and standardization of heavy apparatus in the past. Is it because engineers have felt that simplification of heavy apparatus designs and ratings would stifle development? Is it because the engineers have been too individualistic in their thinking and have taken pride in such thinking? Is it because sufficient price differentials have not existed between standardized apparatus and special, made-to-order equipment? Is it because each manufacturer, competing for business from the utilities, has fought for such business on the basis of which could render the best service in custom-built equipment? Or, is it because the engineers have thought that equipment specially designed for an individual set of conditions had a natural engineering advantage over standard types, sufficiently great to offset any savings in the latter? Whatever the cause may be, we must admit that practically no degree of standardization exists today in the heavy apparatus which accounts for such a large percentage of the capital investment of the utilities.

Let us consider two sets of facts—one obtained through peacetime experimentation and the other through our war production program. General Electric began to investigate the economic advantage to the electrical industry as a whole of repetitive manufacture of heavy apparatus. We chose switchgear, one of the least standard of our lines, as the guinea pig for experimentation. We designed one "Master Type", totally-enclosed, factory-assembled switchgear unit and offered it for sale at a price which would compete with open type switchgear.

Some time later the steel mills were engaged in a tremendous program of expansion and needed a large number of switchgear units. Their engineers could see the advantages of buying standard switchgear and orders for such equipment increased very rapidly. As our production increased our costs went down and, of course, our selling prices followed the trend of our factory costs. Between 1935 and the present time, we have made at least five substantial reductions in prices of this class of switchgear, and today our prices are approximately 35% under those of eight years ago.

In 1939, although we were enjoying a relatively large volume of business in the heavy-duty, steel-mill type, metal-clad switchgear, we found that light-duty equipment was not being accepted as a standard nearly to the degree of its companion heavy-duty types. Believing that we could make substantial savings in the manufacture of light-duty standard switchgear, if it were purchased in a large enough number of units to result in repetitive manufacture, we tried an experiment. We decided to make a drastic 25% reduction in price, which, incidentally,



This chart shows price reductions resulting from standardization of heavy-duty switchgear commenced in 1935

brought it far below our costs, to encourage the use of the standardized smaller unit. In less than one year's time our production jumped more than 600%, costs came down to a point where we could continue to sell at the lower prices. In fact, since that time we have been able to make two further reductions in our prices and today this class of equipment is selling approximately 35% below what it was only five years ago.

By making these lines of metal-clad switchgear on a repetitive basis, we have been able to use production methods that can be used only when many duplicate units are being manufactured. Repetitive manufacturing of switchgear allows production methods such as automatic welding, special punching machines, and conveyor systems for efficient handling of the product. Only through repetitive manufacturing can such specialized machinery be justified. Obviously, our costs, when using such specialized machinery, are considerably lower than when most operations must be done by hand methods.

When it was decided to build our so-called two-ocean navy, our government realized that there did not exist enough turbine manufacturing capacity in this country to produce the large number of ship propulsion units needed. As our company was selected to provide the major portion of this ship propulsion equipment, we built a new plant which was equipped to produce a standardized large turbine on a repetitive manufacturing basis. A production schedule was set up, based on past experience in building turbines, which was thought to be the best which could be hoped for. We found, however, that when it came to producing these large turbines on a repetitive manufacturing basis, each one just like the one before, that we were able to produce about two-thirds more in quantity than we had thought possible. The great individualist of the machine age, the steam turbine, proved as adaptable to repetitive manufacture as the meter, refrigerator, or distribution transformer.

We found that as our production went up our costs came down. Our contracts with the government had been based on costs previously experienced in building turbines, and had been thought most reasonable by both ourselves and the government. We had had no previous experience in building turbines on a repetitive basis and. not until we actually were producing a large number of duplicate equipments, did we realize the large savings to be made by such manufacturing methods. We adopted the policy of reviewing the financial results of these contracts and of giving to the government through reduced prices on new contracts and voluntary price reductions on existing ones, the benefits of these cost savings.

Many similar cases involving other lines could be cited. As an indication of manufacturing economies effected in our war production program as a whole, you will be interested to know that up to the end of 1942 our policy of offering voluntary price reductions on contracts for the government had resulted in definite offers to reduce the aggregate price of 119 war contracts by over $95,000,000. We are convinced that repetitive manufacturing means cost reductions of a substantial nature and, at the same time, gives us a much improved product.

A start has already been made in the utility field. During the summer of 1942 we announced price reductions on selected lines and ratings of eight standard lines of heavy apparatus. These were power transformers, metal-clad switchgear, power factor improvement capacitors, unit substations, large outdoor oil circuit breakers, metal-clad switchgear with magneblast breakers, mechanical drive turbines, and low voltage air circuit breakers. These price reductions amounted to approximately 10% on all but large oil circuit breakers, which were reduced approximately 7½%, and capacitors which were reduced 12½% in July and another 12½% in September. These reductions applied to those ratings which had been standardized to a degree where they were being produced on a repetitive manufacturing basis. We believe that this is only a start, both in the lines selected and in the price differentials offered. The future price trends on these and other lines of heavy apparatus depend upon the extent to which standardization is accepted by the industry.

Because of the rising trends in taxes and operating expenses, and with the possibilities for future improvement in efficiency diminishing, the best source for future savings seems to be centered in the lowering of capital investment, resulting in a reduction of carrying charges and depreciation. Hence the long-term possibilities of lower prices on heavy apparatus, through repetitive manufacturing, would seem now to merit immediate and serious attention.

So far, we have discussed only the savings in costs where standardization is accepted. There are many gains other than first cost to be realized. Some of these other advantages are:

1. By standardization we obtain a better product—better engineered and better made.
2. Ordering is easier because the detailed work of purchasing is reduced to a minimum. In fact, equipment can be purchased in lots of a reasonable number of units for installation at times and locations to be determined afterwards.
3. The installation is speeded up because layout drawings and foundations can be completed as soon as the ratings of the equipments are established and the order placed on the basis of information already available on previous jobs.
4. Operation and maintenance are simplified because of the fewer types and designs of equipment with which the crews must be familiar.
5. Fewer spares are necessary when a large number of units are similar.
6. Delivery time obviously will be cut on standardized apparatus over that of special units.
7. Engineering costs will be reduced and more of the time of the engineers can be devoted to other important matters.
8. Greater reliability of apparatus will be experienced in accepting the general use of more medium-sized units instead of fewer excessively large units. This type of design not only gives a better system under normal conditions, but also is particularly reliable under emergency conditions

such as storms, floods and total war.

9. Lower system investment can be realized by the use of more medium-sized units because additions to the system can be made largely in increments more nearly related to the demand.

10. Greater flexibility will be realized because any installation of equipment, in anticipation of a load which does not develop as expected, made on a standard equipment basis, can be readily transferred to a needed location and with a minimum loss.

You might ask in evaluating the advantages of this program if its acceptance will mean sacrifice in quality. The entire history of standardization, both in durable and consumer goods, shows a rise in quality and concurrently a reduction in cost.

You might ask if this program would result in the freezing of designs. We believe that the answer is "no" because intensive application of engineering, manufacturing and laboratory effort, when applied to a few designs, results in much more accelerated development than when the same effort is dissipated over a wide range of special designs.

Answering the question, "Would acceptance of standard units mean a sacrifice in efficiency compared to types engineered to our particular conditions?", we would say "no", that the standard units are developed with a wide range of conditions in mind and factors which give them a high degree of adaptability to individual conditions are incorporated in the design.

You might ask the question, "Will adherence to standard ratings tie us up with the equipment of any single manufacturer?" The answer to this would definitely be "no", because the many advantages of this program undoubtedly will place it on a broad industry basis.

We believe that the time has come for the electric utilities and manufacturers to get together on the detailed make up of selected types and ratings so that they will meet the maximum number of existing conditions and still lend themselves to repetitive manufacturing techniques. The fact should be emphasized that this is not a manufacturer's problem alone, nor can it be solved only by the utilities. It must have the whole-hearted support of all of the branches of our industry.

In closing, I would like to quote from an editorial in the *Electrical World* of April 3, 1943 under the subject *Investment Evolution*:

"Any practice that tends to increase investment cost without a more than comparable improvement in operations will have little chance of survival. That means that individualism on the part of utility engineers must contribute dollar-wise to efficiency or give way to standardization. Custom-made assemblies must be able to show savings in operation or else yield to ready mades. More favorable attention will be given to products that are built closer to service needs and that reflect such designs in lower prices. Simplification of construction will grow."

REDUCING WARTIME ACCIDENT HAZARDS

HOWARD MILLER
Southern California Edison Co.

PCEA War Conference report by the Operating Economics Section

THERE is no intention of trying to blame all of our accident prevention problems on the war. However, there are many problems which are the direct result of conditions due to the war. Most of them are met by the operating personnel.

Loss of Experienced Supervisors and Workmen

The loss of the young, progressive, and experienced supervisors is the greatest blow of all to the accident prevention program. Our first line supervisors are, or should be, our real contacts with the groups or crews which they supervise. They are the interpreters of company policies and the teachers or trainers of the men under them. They must plan the work to meet safely the rapidly changing work conditions. When they are replaced with less skilled or less experienced supervisors, the safety program receives a serious blow. Almost the entire responsibility for accident prevention rests on the foreman or immediate supervisor. If we lose many of our present supervisors, then surely we must do something at once toward properly training the new ones, and by this I mean an immediate, active training program—not just talk.

The loss of skilled workmen and their replacement by less skilled or less experienced workmen is made more serious by the supervisorial problem just discussed. Many workmen in the public utilities do not have direct supervision and must be taught to be responsible, to some extent, for their own safety and also for the safety of others. In normal times, more serious accidents happen to the old, experienced men than happen to the new men. If you stop to think, you will see how future conditions will be different. In the past we have advanced our men gradually, moving them from simple work to more skilled and complicated jobs as their ability and training indicated. Under war conditions a large number of untrained men will be pushed along or transferred from one job to another. It will be almost impossible to give them the usual training, and they will be given jobs with greater accident prevention responsibilities than they are ready to assume. I believe that the answer to this is, again, a training program which stresses safety.

Hazards Arising Out of Longer Work-Periods

As time goes on, we are going to have fewer and fewer men to do the work necessary to operate our companies. It will be necessary to adopt a policy of longer work-days and work-weeks and, in emergencies, men will have to work long periods without rest. We must not forget that the human machine has its limitations. A man who is fatigued mentally or physically, or both, is not a safe man to place on a hazardous job or to place in a position where he is responsible for others' safety. How long a man should work without a rest-period is

perhaps a controversial subject. Those responsible for the planning or policy in such matters must consider the safety of the men in making their decisions. This is a subject which deserves some study.

Use of Substitute Materials and Tools

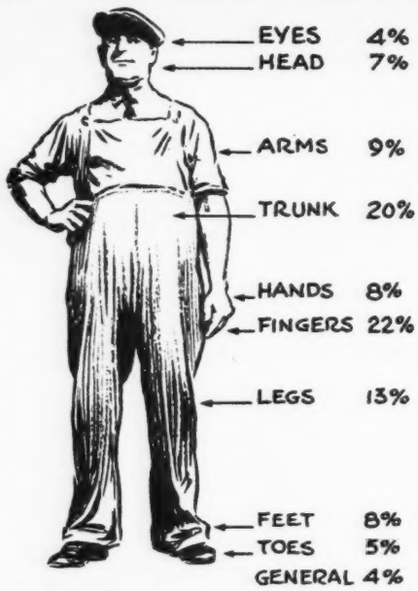
This problem is just beginning to be felt, but it will grow worse as time goes on. High-strength alloy steel will not be available for the manufacture of all the tools and equipment for which it was previously used. Our workmen learn by experience the stresses which can be safely put upon tools and equipment. When inferior material is used in the manufacture of the tools or equipment we should learn the comparative strengths of the new tools or equipment with those previously used and make this information available to the men in the field. If we allow the workmen to learn the hard way it will cause many accidents and probably cost some lives. When a substitution is made, be sure that the men using it are informed that it is a substitute. We should teach the proper care that should be accorded to each item of tools and equipment, and enforce a rigid program to make the present tools and equipment last as long as possible.

One important item is the substitution of sisal for Manila rope. In appearance the sisal rope is as good if not better than the Manila rope. When new, the better grades of sisal rope will test about 80 to 85% as strong as new Manila rope; however, the deterioration period is much shorter. Appearance does not indicate the deterioration in strength which has taken place with use. This constitutes a real hazard until some method of determining the extent of deterioration is devised. The results of the following tests made by our company are not conclusive but should indicate the importance of making further tests and getting this information to the men in the field.

Two hand-lines were made up—one of ½-in. Manila rope and one of ½-in. sisal rope. Tests were made of the new rope and the hand-lines were then put into service. Five months later they were called in and tested, with the following results:

	Manila Rope Load at Breaking (lb.)	Sisal Rope Load at Breaking (lb.)
New Rope	2,975	2,540
After 5 mo. use:		
Average of 5 parts of line	1,846	1,178
Hook or heavily-used end..	1,260	920
Snap or lightly-used end...	2,080	1,150

Interesting facts relative to the tests were as follows: the new sisal was 85% as strong as the new Manila. After five months' use, the sisal was 64% as strong as the used Manila. The average tests indicated the sisal had deteriorated 54%; the Manila, 38%. The heavily-used end of sisal had deteriorated 64%; the like end of Manila 58%. The lightly-used end of sisal had deteriorated 55%; the like end of Manila only 30%.



This graphic chart, showing where accidents strike, is reprinted from Exide News, house organ of the Electric Storage Battery Co., of Philadelphia

Accident Exposure of Plant Guards

This is a problem for two reasons: First, the age and type of men used for this work; and, second, the very poor lighting occasioned by dimout regulations at many locations of the patrolled areas. The manpower situation gives us little choice in picking our guards; however, we should use good judgment in placing them. When possible, the older or less active men should be placed where there is the least difficult terrain. The lighting problem is made difficult by the dimout regulations, but a study should be made of the patrolled areas and every advantage taken of the allowed lighting. Good housekeeping around the patrolled areas is now more important than ever. Little things that amount to nothing in daylight become real hazards in the dark. Small depressions, raised curbs, or any obstructions in the patrol path should be lighted or eliminated.

Maintaining Interest

This is a difficult problem in such turbulent times. We are likely to hear the expression "we have a war to fight" many times in our efforts to build up or maintain interest in the safety program. The fact that we do have a war to fight makes the safety program even more important. Men or material lost through accidents can no longer be replaced. Anything that distracts or interferes with the peace of mind of our personnel will affect the interest in the safety program. The most common distractions caused by the war are the uncertainty of occupational deferments, worry over the welfare of family members in the armed service, and labor and wage controversies.

The distraction caused by the uncertainty of occupational deferments is something over which we have no control but which we must recognize.

Perhaps nothing can be done to prevent distraction due to worry over the welfare of relatives on the war fronts. Supervisors should keep this fact in mind and not allow men who are upset over some critical situation to undertake complicated or hazardous work.

The subject of labor and wage controversies need not necessarily be a wartime problem, but it is certain that it is more widespread and more acute because of conditions brought on by the war. According to the National Safety Congress, the disregard of supervisory authority and the continuous state of mental unrest caused by labor and wage controversies is one of the basic causes of the terrible accident records of some of our industries today. This should be recognized and every effort made to alleviate this condition when and where it exists.

In conclusion, it can be stated that before this war is over we will probably have more serious accident prevention problems than the ones mentioned. Let us do something now about the present problems so that we will be better able to cope with the new ones when they arise.

THE SAFEST INDUSTRIES

Days lost per 1,000 man-hours worked

Telephone, telegraph, radio	.2
Glass	1.0
Automobile	1.1
Transportation	1.3
Rubber	1.3
Machinery	1.3
Airplane manufacture	1.4
Public utilities	1.5
Filling stations	1.6
All industries	1.7
Chemical	1.8
Metal products	2.1
Steel	2.1
Petroleum	2.3
Sheet metal	2.9
Marine	3.0
Cement	3.0
Lumber	4.5
Quarry	5.0
Construction	5.7
Mining	9.4

SAVINGS FROM INCREASED CAPACITY

Critical materials preserved by heavier operating duties

J. V. KRESSER
Westinghouse Electric & Mfg. Co.

PCEA War Conference report by the Operating Economics Section

As a result of the shortage of critical materials and the difficulty of obtaining high priorities, the utility industry is faced with the problem of supplying increased loads with minimum purchases of new equipment. When we realize that about 60,000 tons of copper and 125,000 tons of steel are required for an average year's production of transformers alone, we can appreciate that any measure employed to decrease the installation of new equipment is a patriotic one and will result in no small contribution to the war effort by savings in these strategic materials. The shortage of these materials makes it imperative that all existing electrical equipment be used to the best advantage, even though it may entail a reduction in operating economy.

There are three general ways by which additional loads can be supplied with minimum purchases of new equipment.

1. Equipment can be switched around in the system so that it will fit in best with load requirements in particular locations. Obviously, this method is limited in scope, especially if most of the equipment is already operating close to name-plate rating.

2. Equipment can be up-rated, that is, made to supply loads greater than normally designated by the name-plate rating. By this is meant using the equipment to its best advantage; it does not necessarily imply overloading.

3. The power factor of the system or parts of the system, can be improved by installing static capacitors. Improving the power factor allows the equipment to supply more kilowatts since part of the load kilovars is offset by the capacitor kilovars. This method may offer great possibilities in certain installations.

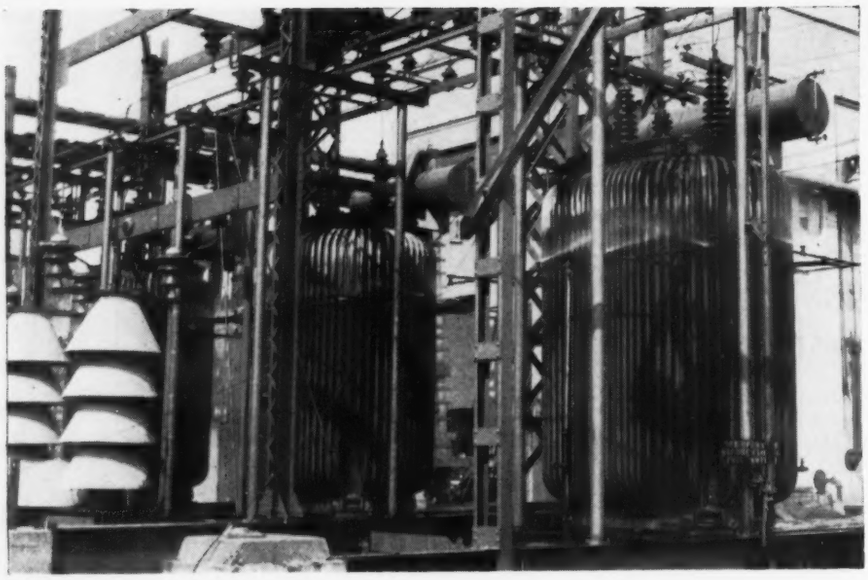
We will concern ourselves mainly with the up-rating of existing equipment, particularly transformers. As stated before, up-rating does not mean overloading; it means operating it at higher than name-plate rating by the use of suitable rules and methods. Overloading results in a decrease of the useful life of the equipment, while in a majority of cases up-rating the equipment by making full use of its capability, is obtained without sacrifice of life expectancy. Of course, in certain cases, equipment cannot be up-rated without decreasing its life. This is to be expected and, as more old equipment is up-rated, the number of cases where sacrifice of life expectancy cannot be avoided will increase.

A number of investigators have studied the effects of temperature on insulation and, although the results obtained by the various investigators do not check closely, they all reached similar conclusions as to the general effect of different temperatures on insulation, that is, mechanical deterioration and oxidation. The AIEE, recognizing the work of these investigators, has comparatively recently revised the recommendations on loading of transformers. For all cases, except short-time emergency overloads, the up-rating is obtained without sacrifice of life expectancy. In the case of short-time emergency overloads it was recognized that these occur infrequently and some sacrifice of life could be made. For these short-time emergency overloads, occurring not more than once during any 24-hour period and not more than about 25 times during the life of the transformer, an estimated average sacrifice of 1% of normal life is made for each emergency operation.

When the loading exceeds those specified in the AIEE report, some form of supplemental cooling such as water-spray, air-blast, or forced-oil can be employed for further up-rating of the transformer. Obviously, it is not possible to state definitely what increase in capacity of existing transformers can be obtained by using supplemental cooling, since this increase is dependent on a number of factors such as age and condition of transformer, its type and design. In general the increase may be as high as 33% by using air-blast and 67% by using forced-oil circulation and heat exchangers. However, only on new transformers designed for such operation, or on fairly new transformers modified for supplemental cooling, will the increase in capacity be as high as the figures given. In many cases the increase may be considerably lower than the optimum. In fact, considerable caution should be exercised in applying forced-oil cooling units to existing transformers. This point cannot be emphasized too strongly, as improper application may result in a transformer failure.

Forced-oil coolers cannot and should not be applied indiscriminately or by any rule-of-thumb methods to transformers which were not originally designed for forced-oil circulation. In most cases the oil will flow mainly between the windings and the tank and, although the top oil temperature may be within reasonable limits, a high gradient may exist between the top inside turns and the top oil. In other words, although the temperature drop from top oil to bottom oil may be low, the temperature drop from top copper to top oil may be quite high. In order to keep the temperature gradients within safe limits and at the same time rely on top oil temperature for reasonably accurate indication of copper temperature, a wide variation of oil flow and heat exchanger drop has to be employed for various transformer types and designs. The heat dissipating capacity of the cooler is only one of the requirements of the system. Therefore, a unit consisting of a pump and a cooler of given kilowatt capacity cannot and should not be universally applied to all transformers of a given rating.

Some of the transformer manufacturers now have available air-blast and forced-oil cooling equipment for application to existing transformers. The transformer manufacturer should



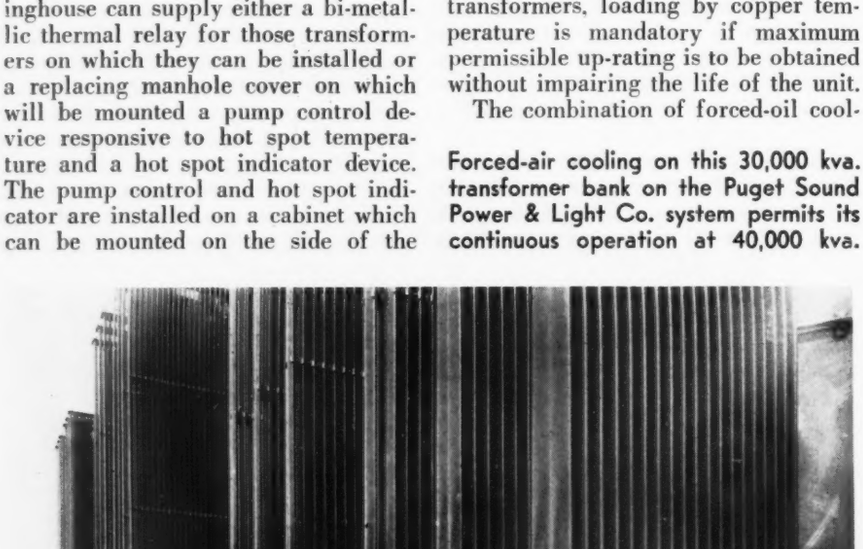
By using a water spray, Northwestern Electric Co. is carrying 23,000 kva. on this bank of three 5,000-kva., 66/11 kv. transformers. The water spray permits overloading the transformer bank without exceeding temperature limits

be consulted in every case for his recommendation on the type of equipment to be used for a given percentage of up-rating of the transformer.

As brought out earlier, when forced-oil cooling is applied, the top oil temperature may give an erroneous indication of the true conditions in the transformer. A device responsive to hot spot temperature to control the pump and indicate the hot spot temperature is very desirable. Among others, Westinghouse can supply either a bi-metallic thermal relay for those transformers on which they can be installed or a replacing manhole cover on which will be mounted a pump control device responsive to hot spot temperature and a hot spot indicator device. The pump control and hot spot indicator are installed on a cabinet which can be mounted on the side of the tank. These devices allow loading the transformers by copper temperature. When applying loads in line with the latest AIEE recommendations, whether for self-cooled, air-blast or forced-oil transformers, loading by copper temperature is mandatory if maximum permissible up-rating is to be obtained without impairing the life of the unit.

The combination of forced-oil cooling and capacitor installation on low power factor loads can yield amazing increases. For example, assume full benefit of 67% increase can be obtained on an existing transformer by forced-oil cooling, and that the transformer supplied an 80% power factor load. The installation of forced-oil cooling and of capacitors that will raise the transformer power factor to 96% will allow the transformer to supply twice the load it formerly did, assuming the increased load is at the same power factor as the original load. The capacitor requirement is 46% of the transformer kva. output. A further advantage of the capacitor installation is that it will partially compensate for the increased regulation of the transformer when it is up-rated as a result of forced-oil cooling.

Forced-air cooling on this 30,000 kva. transformer bank on the Puget Sound Power & Light Co. system permits its continuous operation at 40,000 kva.



The amount of up-rating may be limited by the transformer itself or by other elements in the transmission or distribution system. In the transformer, the limitation may be imposed by leads, taps, bushings or current transformers. This should be checked with the manufacturer.

Transmission and distribution elements such as circuit breakers and disconnecting switches are subject to definite temperature limitations. This is due to the rapid oxidation of copper above 90° C. As copper oxide has a relatively high resistance in even very thin films, continuous current carrying contacts are normally rated at 80° C. maximum temperature or below.

Underground cables may present a real problem. Where the cable is buried directly in the ground over its whole length, increased losses can be dissipated and some up-rating may be possible. However, cables located in ducts, conduits or tunnels present complicated heat dissipation problems. The consensus seems to be that cables cannot be up-rated except in the most favorable conditions, and sometimes not even then. Again, in the case of low power factor loads, static capacitors can be used to release cable or feeder capacity.

Overhead lines of bare wire do not present quite such a problem. In many cases there is some margin available. Where there is not, increased capacity is obtained at the cost of higher losses and regulation. Since for bare wire air is the heat dissipating medium, conductor temperature is not the main factor. For high voltage lines corona is one of the main factors while for medium and low voltage lines, over-all transmission or distribution economy is an important factor. However, during the emergency, some sacrifice of economy has to be made, and it is small compared to the benefits of the saving in critical materials.

PERSONNEL TRAINING IN WARTIME

A. A. STRAUB
Southern California Edison Co.

PCEA War Conference report by the Operating Economics Section

CHANGES in personnel training methods are required during wartime and under restricted manpower conditions. This is not necessarily because personnel does not require as careful training during peacetime and under conditions of sufficient or even excess manpower; but because of our own desire to relax all activity during periods of abundance. During prosperous manpower periods it is much easier to replace a man that has inferior ability with a man who has superior ability and initiative, than to struggle along training the inferior man. Therefore, being human, we take the easy path.

In the personnel problem under war conditions we literally have our backs to the wall. And where the word "man" or "manpower" appears in this paper, it refers to both men and women because we have just about reached a condition where women are no more available than men.

Many of the better educated and physically and mentally superior men rush to the armed services for commissions or to the war production plants for temporary high salaries. The young or middle-aged men of average ability are inducted into the armed services. The manpower material remaining consists of probably three categories: (1) a few good men who can be deferred because of a large family and are more interested in permanent job security for that family and for themselves than they are in temporary high salaries; (2) the men of average ability and age who are physically unfit for military service; (3) men beyond the military age limit who do not have the ability or the physical requirements for war production work.

The first category is the most desirable and the least available. The second category is usable if we adjust our medical requirements to make them available, and adjust the work to fit the man's physical ability. This problem of protecting the man's physical condition will require careful attention or our casualties will be too high to justify using these men.

The third category probably will be composed of men who have spent most of their lives as laborers or are retired from other lines of endeavor. They are probably, with some exceptions, the most difficult to train, because their minds are not active and their memories not equal to younger men. Also they do not have the desire for a permanent position nor for advancement. But, if they can be fitted into the organization, their steadiness, judgment, and reliability should be very valuable.

We have to this point analyzed the available manpower material. To some of the more pessimistic observers our problem may appear hopeless. But I don't agree with that observation. If we adjust our training methods, it appears to me that we can continue to operate with efficiency almost equal to that which has existed in the past. Before we can streamline our methods we must determine two things: What is personnel training and why is it necessary?

To me, personnel training is a procedure which assists in the development of the mind and the coordination of the muscles for a definite purpose. That purpose is to make possible the production of raw material and the manufacturing, transmitting, distributing, selling and consuming of the desired product or service.

The reason for personnel training is to make possible a product or service which is superior to all competitive products or services and which can be delivered to the customer at a cost not greater than the cost of competitive products or services; or to produce a product that is at least equal to competitive products in quality and quantity and can be delivered at a lower cost.

In addition to the above requirements our service or product must be of such a nature that it will aid in the advancement of the American standard of living which is already second to none. All of the requirements stated here can be developed only through forethought, careful planning and efficient operation, which are made possible by utilizing correct methods of personnel training.

It appears that the proper training procedure requires the elimination of educational classes and group methods of training and substitution of piece work methods of training, because each employee will be a very definite individual problem.

The method of training these individuals should follow a procedure similar to the methods devised and used by the War Manpower Commission. This procedure makes use of what is known as a "job break down sheet." This sheet is made up in two columns. The first column outlines in detail each move or operation that is required to perform a certain duty. The second column lists the key points involved in performing this duty and is shown in the text in parentheses. The key points can be similar to those used in memory courses. They are for the purpose of giving the student something to swing on mentally, or as supplementary safety suggestions, etc.

In some cases it may be advisable to expand these key points briefly by giving an explanation for their existence if the reason is not readily apparent. For simple operations this break down sheet can be devised mentally by the instructor, including the key points.

Breakdown Sheet for Clearing the Long Beach 66-Kv. Oil Switch for Work—

1. Determine from man desiring the switch just what his desires are. (Make notes so you don't make an error.)
2. Repeat his desires to him for his approval of your interpretation of your notes. (Be sure you have his attention while doing this.)
3. Go to your company phone and pull phone switch to down position. (Be sure all other phone switches are normal. Use local phones only when necessary because their lines are already overloaded.) Lift the receiver off of the hook with your left hand and place the large end to your ear and listen. If no one is talking speak into the transmitter and ask if the line

is busy. If no one answers you, press the receiver hook down with the hand holding the receiver, turn the small handle on the right side of the phone for approximately two seconds and stop. (Ringing must be accomplished by a steady unhesitating motion.) Then immediately turn it again for approximately one second. This will ring all phones on the line one long and one short ring. This code of one long and one short ring is the code ring for your dispatching center which is Lighthipe substation. (Study and memorize all code rings for stations on your lines, especially your own.)

4. When your dispatcher comes on the line he will say "Lighthipe-Sarson," meaning Lighthipe substation, Sarson speaking. (Be sure you get this man's name.) Then state "This is Horton at Alon." Tell Sarson clearly, from your notes, what you wish to do. Sarson will now give you your switching orders as follows: "You can close the transfer bus disconnects and open the oil switch to the Long Beach 66-kv. line at Alon. Then open the line and bus disconnects to the Long Beach 66-kv. oil switch." (Make notes so you will be able to repeat the order exactly as it is given to you.)

5. Repeat the order to Sarson exactly as he has given it to you and be sure he approves it. Hang the telephone receiver back on the hook with the large end down.

6. Execute your orders in the exact sequence as they were given. (If you have someone to check your operations be sure he knows what you intend to do before you do it. Read the signs to be sure you are switching the correct line. Check and double-check before performing any operation.)

A. Close the transfer bus disconnects. There are three of them.

NOTE: Look at your clock and make note of the time.

B. Check the switchboard nameplates to be sure you are in the proper position then open the oil switch to the Long Beach 66-kv. line.

NOTE: This is done by turning the oil switch control handle to the left until it strikes the stop, preferably with your right hand, hold the handle in this position until the red light goes out and the green light is lighted. The change of the lights indicates that the oil switch is open. Make a note of the time.

C. Check the mechanical target on the Long Beach 66-kv. oil switch to be sure that it did not open as indicated by the switch board lights.

Open the line and bus disconnects to the Long Beach 66-kv. oil switch and note the time. (Be sure you read the sign board and remember that there are three line disconnects and three bus disconnects. Count them to be sure they are all open.)

D. The operations are now completed. Ring Lighthipe again and state that this is Horton at Alon and report the operations in the exact sequence which they were performed. (Be sure you know to whom you are talking because dispatcher may have changed shifts.)

EXAMPLE: At 9:32/a, I closed the transfer bus disconnects and opened the oil switch to the Long Beach 66-kv. line at Alon, and at 9:35/a, I opened the line and bus disconnects to the Long Beach 66-kv. oil switch.

E. After reporting to Lighthipe write all the operations in your log book exactly as described in your Bulletin No. 102.

The "break down" sheet described here is intended to serve only as an example and is not complete. In actual practice it should be carried forward to include the placing of work signs and barriers and the issuing of a working clearance.

To this point we have considered the more difficult aspect of the personnel problem, that is training the manpower or womanpower probably available from outside sources. Let us consider now the reservoir of partially-trained personnel within our ranks.

One source is the retired men now on pension. Certain physically-able members of this group are willing and anxious to assist in any capacity during the emergency. Their long service, training and capability make them particularly desirable for the relatively short period of the emergency. Training such men consists in bringing them up to date on developments which have occurred since their retirement, or adapting them to the different routine of a department which works parallel to the department in which they spent the majority of their normal working years. The value of such men must not be overlooked from the viewpoint of training new personnel. Temperament permitting, the general stability and background of such men make them particularly desirable for training new employees.

Another group must not be overlooked, and that comprises the men who, as they advance in age, are not able to perform the more strenuous duties of some jobs, such as climbing poles or towers. The years of training and familiarity which they have acquired with the physical system constitute a splendid background which will permit an easy transition to a less strenuous position. Again they are a potential source of instruction for the young and new employees.

In the clerical organizations, we have many men who formerly were employed in the critical operating and maintenance positions. They may be available for extra work at their old positions in addition to the work they are now doing.

Each of the groups, pensioners, transfers and part-time workers, is an individual group. Even their cases are individual and no general rules can be made. Physical ability, adaptability, temperament and availability have to be considered in each case. Training must be individual if we are to make the most of this reservoir of help.

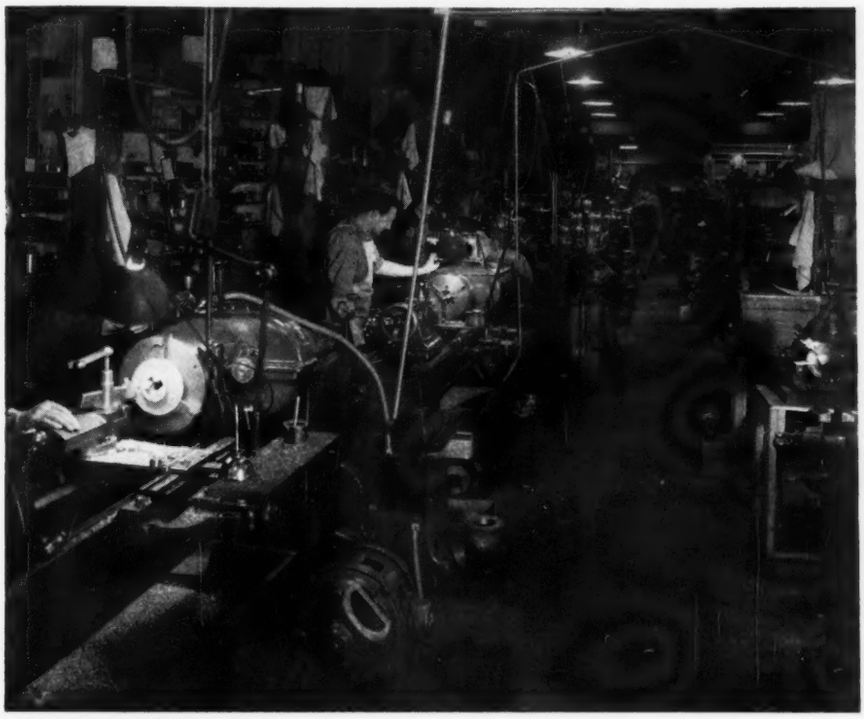
We are fighting an all-out war. All-out methods must be used to train and utilize to the ultimate all available manpower and womanpower for the operations of our vital and essential industry.

Training women to fill jobs requiring technical knowledge is one of today's manpower problems. The women pictured are just two of the many who are learning to do unaccustomed tasks

Testimonials

Sequel to the description of localized lighting for a machine shop last month is this testimony from men who work under it

C. W. Macy
S. F. Div. PG and E



General illumination of from 20 to 22 fc. is supplemented within proper ratio at each machine by local units giving from 80 to 250 fc. on critical seeing tasks. General lighting is largely from RLM incandescent and fluorescent units. Local lighting at dry lathes shown above is from Fostoria bracket and reflector units with silverbowl lamps to eliminate glare. For oil splash other units were designed

"YES, it must be a fine installation from what this article about it tells, but what I would like to know is what the men who work under it *really* think about it, especially after working under it for awhile."

Such a thoughtful question probably raises itself in the minds of many who read a description of an exceptional lighting installation. To convince other plant managements that similar lighting treatment should be given their own shops without such testimonial evidence is ofttimes difficult. The outlay for a rewiring and relighting program must be justified in terms of (1) increased production, (2) decreased waste and errors, (3) increased safety and/or (4) improved morale.

Since the relighting of the plant of Charles M. Bailey Co. in San Francisco, described in detail in the last issue (May 1943, p. 60) was considered to be an example from which such facts might be learned, interviews were held with individuals connected with the plant management and workers themselves to get their views. The reactions of a night-shift machinist, a night-shift foreman, a day-shift machinist, the plant superintendent, the general manager and the owner were sought after the plant had been relighted and time had been allowed for the crew to become accustomed to it and to make such individual adjustments as they desired.

In such interviews the opinions of these men were directed to find out whether the lighting, which combined an average 22-fc. level of general lighting with local intensities on critical work ranging up from 80 to 250 fc., was truly (1) increasing production, (2) reducing waste and errors, (3) increasing safety and (4) improving morale. The following are statements made by these individuals in each of the above categories. They are reported as nearly word for word as spoken by the men as the interviewer could recall or report.

First to be interviewed was night-shift machinist G. L. Marshall, whose remarks are classified under the four heads as follows:

Production

We used to lose long periods of time just looking for materials and tools. Now it takes a fraction of the time.

Much time was lost setting up jobs, checking the work, and changing tools. Now a "mike" can be read right on the point and no time is lost whatever.

The quality of the products is much improved now. Possible errors are caught before a job has progressed to the point where materials have been ruined.

Many of the present-day beginners would never have been able to hold down their present jobs had they been forced to break in and work under the old lighting system.

We are making approximately 70% to 80% less errors. It used to be if one of us ran a whole night without an error, we thought that we were doing pretty well. Now we often run a whole week without an error and think nothing of it.

In spite of taking on many new green men, we are making at least 10% more in production with this lighting system. It is not fair to compare our old trained crew under the old lighting system with the present partially unseasoned crew under the better lighting. If we still had our original men under these lights, our increase in production would be far greater.

For an example, on work that I am now doing, we men who have been here for a year or more now turn out 12 units where we used to turn out 10, and with less effort.

Waste of Materials

We can re-cast much of our materials when errors prevent completion of jobs, but the loss in man-hours and wear and tear on machinery is gone forever.

That loss has been reduced a conservative 75%. This is an item that would be difficult to figure in dollars due to so many factors. However, anyone acquainted with machine work knows that this item is of serious importance and in proportion to the amount of work done."

Safety

Under the old conditions there was a serious hazard because we had to be so close to our tools. Chips would fly into our eyes.

We would stumble over materials or laid out work on the floors.

Moving tools or work could not be safely followed by the eye.

The new lighting has eliminated many hazards and has made it a far safer shop to work in.

We can keep new men now and this cut in turnover of men is not only cheaper from a training cost viewpoint but saves many accidents because the men become well acquainted with the shop and the tools they are working on.

Human Factor

We used to have very little light but we did have much glare here. We could not see our work well, and due to bad eye strain, the tool boxes contained many aspirin tablets.

At the end of a shift my eyes were so tired that they would not allow me to read after I reached home.

I used to stand at my machine tensed, due to straining my eyes to see, and so I was always tired—particularly towards the

end of the shift. Sometimes I would catch myself being cross with my family.

Poor lighting was often indirectly responsible for men leaving the shop for other jobs—particularly to get on day-shift work where the light would naturally be much better.

No longer is there any glare or objectionable shadows. I can see with ease during the entire shift and without any eye strain. Actually the aspirin has disappeared from the tool boxes.

When I go home I am not nearly so tired as I used to be although I turn out more work. I even feel like reading and often do so for a couple of hours or so.

My wife has noticed a difference in me, that the nervous tension has all disappeared. She seldom has to wait up for me and I usually cook my own supper. It is no longer a burden to me.

The whole shop is far better satisfied. The atmosphere is more cheerful and friendly, and one feels so much more like coming down to work when there is good light on the job.

Everything else being equal, a fellow would think many times before changing to another shop where undoubtedly the lighting would not compare with what we have here.

In General

When a plant owner has $200,000 invested in machinery, some machines costing close to $30,000, is it not foolish to neglect an investment of some $2,500 for good lighting in order to see the work to be done on these same machines?

The difference between partial production and full production, due to light alone, would more than pay for the change within how many months? My guess would be from three to six months.

Next to be asked his reactions was the night-shift foreman, A. E. Bentley, who had the following to say:

Production

If we had the standard average prewar type of men with average eyes, we would have increased production probably 20% or more.

In spite of war conditions we are able to obtain at least 10% more in production on the night shift with your new lighting design.

When a man's eyes are tired he is tired all over and can't produce as much, is irritable, and less accurate.

This type of lighting makes it possible for the elderly worker on all-around machine shop work to be reasonably effective on the night shift.

Wastage

At least 25% of previous wastage, due to mistakes, has been eliminated.

There is much less wasted time on the part of employees and less carelessness.

Reading "mikes" to .001 in. can be done much faster and far more accurately.

A worker under poor lights at the end of approximately six hours tends to become very tired and careless.

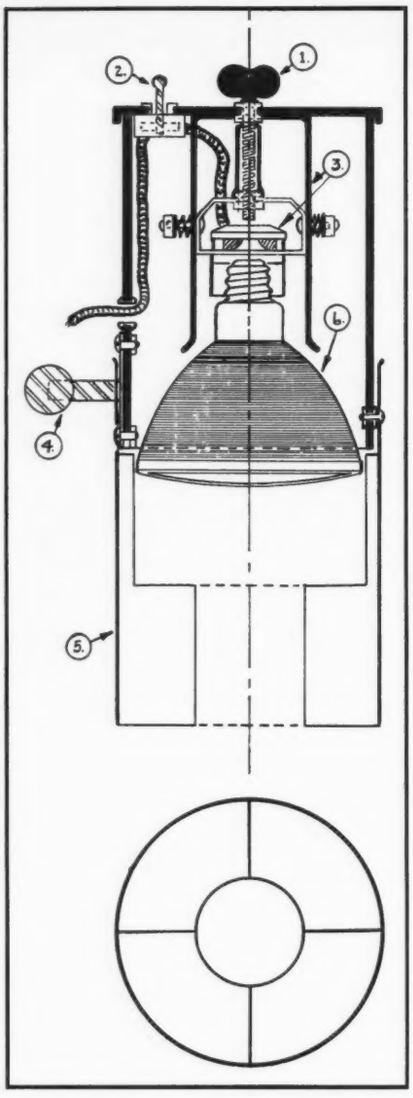
Safety

Tripping in the aisles is eliminated. The frequency had been about once a month.

Knocking over machined parts has been eliminated.

It is much safer for the men around machines.

I used to use Murine in my eyes to rest them at the end of the night shift, in order to sleep.



For precision work, high intensity unit like this was designed by Macy for mounting high above the oil splash—(1) Adjusting screw; (2) switch; (3) adjustable socket; (4) supporting base; (5) louvre; (6) PAR-38 Reflecto-flood. Below, louvre design

We were all so tired towards the latter part of a shift that the work was hazardous.

It is now much safer for the supervisors as well as the workmen. I have worked here for about 2½ years and there is no doubt whatever that it is now a far safer place to work in.

Morale

The new lights have helped enormously to make the men more satisfied with their working conditions.

Men have to have good physical conditions about their immediate work areas in order to be satisfied and happy with their job.

Excellent light like this makes the men proud of their shop and they will talk about it outside.

As far as I know there are no shops in San Francisco lighted as well as this shop.

This lighting installation was one of the best investments that the owner ever made.

I can sense a much better feeling about the shop since the lighting installation was completed.

To get the viewpoint of day-shift workers, one of them was also interviewed and H. Stephens had these comments to make:

Before the lighting change there was a very great deal of glare from the lights. There were no handy lights on the machines. Poor shields around the lamps on drop cords gave a great deal of glare without enough light. It was impossible to see into cavities when taking inside cuts. It was difficult to read the "mikes."

The general light intensity was very poor and hard on my eyes. There were heavy shadows under the benches and machines and it always took considerable unnecessary time to procure an extension light in order to find tools and materials.

Now the general light is easy on my eyes. Light can be applied immediately just where it is wanted. There is no glare as the silvered bowl lamps have eliminated that as well as the reflected glare from the lights on the machines.

There are no more deep shadows and I can and do find anything in the shop at a glance.

The light on the machines is easy on my eyes and close work can be done readily.

There is real relief from the previous nervous strain from fighting the work under poor lighting conditions.

I can see to read the "mikes" quickly and with accuracy. I feel a much greater degree of confidence in my work.

When comparing our new lighting with the lighting in most of the other shops, the working conditions are far in our favor.

A man feels a whole lot more like coming to work in the morning with the new seeing conditions."

Plant superintendent Kay LaPoint summarized many previous views in his own comments:

Production on different machines varies but an over-all of at least 20% better production has been gained due to the better lighting. These lights aid on the day shift by reducing the changing of intensity. Only a portion of the general lighting remains on all day but each of the supplementary lights stays on constantly.

Waste and errors—The loss in time and materials has been cut by 40%. The eye strain has been eliminated and this has speeded up the entire shop.

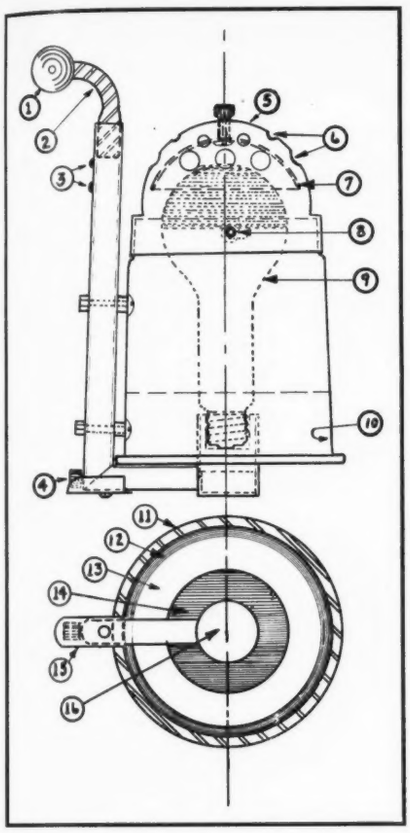
Accidents due to lack of light have been eliminated. Hazards due to deep shadows used to be common but they are gone now.

As to morale, the men are more willing to work steady. The improvement in seeing conditions was appreciated by the older men most. All complaints about poor lighting have stopped completely.

I can stand in one spot now and see everything in the shop. I can see whatever everyone is doing, on the night shift just as well as in daytime. Before the change it was just the reverse. Supervisors are more efficient and better satisfied. Cooperation on the part of all is far better.

The viewpoint of plant management was expressed by K. K. LaPoint, general manager, in the following letter:

It has always been our endeavor to create the most favorable working conditions for our employees and it seemed to us that a properly lighted plant would be one of the greatest improvements possible. We had tried, at considerable cost, to secure proper lighting but with unfavorable results. We are positive now that this was not checked into thoroughly before the system was installed.



Replacing the silverbowl lamp renews the reflector in this high intensity design which was adapted by the author

(1) Standard 1-in. ball; (2) 90° angle; (3) non-metallic bushing; (4) switch; (5) removable dome; (6) vents; (7) light baffle; (8) slip spuds; (9) 150-watt IFSB lamp; (10) black finish, balance in flat white; (11) outside shell; (12) black band; (13) white reflection surface; (14) silvered bowl lamp; (15) switch guard; and (16) socket holder

as we can see the results of a properly designed and supervised system.

Since installing the new system we find our production has increased in the neighborhood of 15% over all. Most of this increase is due to the elimination of errors in machine work, because of poor visibility of work. Naturally, this elimination of errors saves critical material, for when a casting is spoiled it can be used for nothing but scrap.

In our type of manufacture it is necessary that we have a quantity of rough and semi-finished work on the floor at all times. In a poorly lighted plant this naturally becomes very much of a hazard. Since the installation of the new system in our plant, all parts are uniformly lighted and, as a result, any and all places can be seen without particular effort. In fact, a person can stand in one end of the shop and see very clearly the tools and materials at the other end of the shop.

In our estimation, the greatest improvement due to proper lighting, has been that of the morale of our employees. We can say that many of our men were dubious of the results of this lighting system when it was being installed. However, since it has been installed, every man without exception has complimented us on the better lighting. In fact, one man told us that it is "the greatest thing we have done to improve the working conditions." Within the past few months several men had left us for other jobs. Since then, three of these men have returned and each made a statement to the effect that they had returned due to the prevailing working conditions in this plant. One of the reasons mentioned for returning was the recently installed proper lighting system. Also, we now have men desiring to work night shift as they claim this type of light is no harder on their eyes than daylight.

Finally, what does the owner of the plant think of it? It was he who made the outlay for relighting very shortly after he had just spent a considerable sum for lighting. His views are expressed in the following letter. These are the views of Charles H. Bailey, owner.

Having realized for a long time that in order to do the best work one must have the nearest thing to broad daylight it is possible to obtain, and knowing that our small factory was far from perfect, we installed a number of additional skylights which helped greatly on a bright day, but on dark days, or at night, did not serve our purpose.

We installed electric lights with 12-in. white enameled reflectors throughout the plant, placing them wherever the foreman and operator thought they should be. In addition to this each operator improvised a special light of his own for the tool he operated. We thought this idea was very good until the Pacific Gas and Electric Co's lighting engineer, Mr. Macy, called on us and sold the idea that lighting could be scientifically done. In some places we had too much light, and in others not enough. We were aware of this, but to remedy it was something else, and apparently was going to cost us more money than we felt we could spend. However, I had noticed that on operations inside of valves, mechanics were having difficulty in seeing what they were doing, so decided to spend the money anyway, even though it meant taking out all of the lighting which had recently been installed. Mr. Macy had a complete layout of the entire plant and measured the light at each machine, with the result that our lighting is as good at night as in the daytime.

Many of the men have expressed their gratification of this effort to improve their working conditions and we have had some express their enthusiasm with statements such as "the best thing ever done for the men" and "no more headaches after quitting work or eye itching and burning after watching the job for two or three hours." We formerly had men refuse to work nights, who would now just as soon be on the night shift—in fact, prefer it, as they receive more money per hour.

While our machine shop turnover is very low, there have been some cases, due principally to two reasons, the first, other shops are offering longer hours, that is, greater overtime, and second, the light situation. A number of these men have wanted to return and some few whose places were not filled have been taken back—two just recently, and when asked for a definite reason as to why the other jobs did not pan out to suit them, have frankly stated the working conditions were much better in our shop, including the lighting.

We have increased our production quite materially and are sure that at least 15 per cent is due to the improved lighting in our plant.

It is from such testimonials that the ultimate worth of a lighting installation, which means a money outlay, must be judged. These back up the technical reasoning, the foot-candle readings, the usual yardsticks by which a lighting installation is measured by adding the vitally important factors of employee reaction and morale, safety, and care in workmanship which results in less spoilage and waste of materials. Under wartime pressure, with unpopular night-shift operation, this factor is one of the heaviest in weight.

The proof of the lighting is in the seeing.

Contractor's Story

The story of Ziebarth Construction breaks new ground in the use of literature by an electrical contractor to build new business. It is a profusely illustrated brochure published by Fritz Ziebarth, Long Beach electrical contractor, and tells of large-scale jobs carried through speedily and successfully by his organization. Among these are many Bonneville power lines, the Basic Magnesium Inc. power line and pumping plant, Metropolitan Water District power lines, a long list of power lines for private utilities, irrigation districts, REA's, and the U. S. Engineers.

Those electricians on stilts at Tacoma, each one specializing in a single operation to speed the wiring of barracks at Ft. Lewis. Charles McPhail, Electric Construction Co., Tacoma, had the idea

EMEA *Dope Sheet*

How to Check Motor Air Gaps for Bearing Wear

Oliver V. Anderson
Educational Committee Chairman
Electrical Maintenance Engineers Assn. of Southern California

Supplies, Tools and Equipment

1. Motor gap testing thickness gage, consisting of nine 9-in. leaves of .002, .003, .004, .005, .006, .008, .010, .015, .020 in. thick.
2. Safety tag.
3. Pencil and paper.

Procedure

1. *Clear Motor for Work*

Follow usual plant and safety procedure for taking a clearance on a unit of electrical equipment.

2. *Make Circular Sketch for Recording Motor Air Gap Values*

NOTE: Correct determination of sleeve bearing motor air gaps, and a record of these values, is of vital importance to the maintenance electrician. Many expensive motor failures, which are caused by the rotor rubbing on the stator laminations, can be attributed directly to the fact that the maintenance electrician has failed to obtain and keep regular and accurate records of the air gaps of the motors in his care. The first evidence of a worn out sleeve in a motor too often comes in the form of smoke curling up from the motor, and then it is too late to prevent serious damage. Motor bearings should always be replaced *before* the rotor rubs even a slight amount on the stator. The method outlined below is suitable for checking all open or accessible types of motors.

a. Draw circle to represent motor air gap.
b. Mark four points as top, bottom, right and left (note drawing)
c. Write front and rear at each of these points.
d. Designate motor drive connection as belt, gear, chain or direct. A flexible coupling is a sample of a direct drive.
e. Indicate the position of pinion and driven gear, or the direction of belt or chain pull as the case may be.

3. *Observe and Record Air Gaps Around Rotor*

a. Push one of the thinner leaves into the air gap, and after noting its thickness, select a thicker one or combination of several until a combination is obtained that is just a snug fit.

NOTE: Be careful when checking small motors, as a hard push may raise the weight of the rotor and indicate a larger air gap than actually exists. Be careful not to buckle leaves by pushing too hard on them. Be sure there is not dirt between the leaves when a combination of several of them is used. When checking the air gaps of very large motors push the gage leaves into the air gap approximately two inches. The pulley end of the motor is designated as the rear and the end opposite is designated as the front. Readings should be taken and tabulated accordingly.

b. Check and record the air gaps at the four designated positions around the rotor.

4. *Analyze the Results of the Values*

a. Compare front and rear air gap thicknesses, or values.
b. Compare top and bottom values.
c. Compare readings on opposite sides of rotor in the direction of the belt pull. (Be sure belt is on and normally tight when these values are obtained.)
d. Average the air gap values, and determine what the average air gap would be if the rotor were exactly centered in the stator.
e. Note down your recommendations.
f. Sign your report.

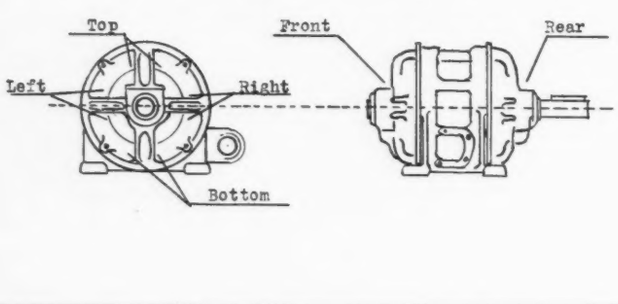
NOTE: If air gap is smallest at bottom or in the direction of the belt pull, and the normal average gap has been reduced by 50% or over, it is advisable to recommend bearing replacement. When the bearing wear allows the rotor to approach closer to the stator on one side, magnetic pull becomes unbalanced and large forces tend to draw the rotor toward the stator at the point of the least air gap. This effect may be somewhat compensated for on three-phase motors by connecting pole phase groups on opposite sides of the stator in parallel.

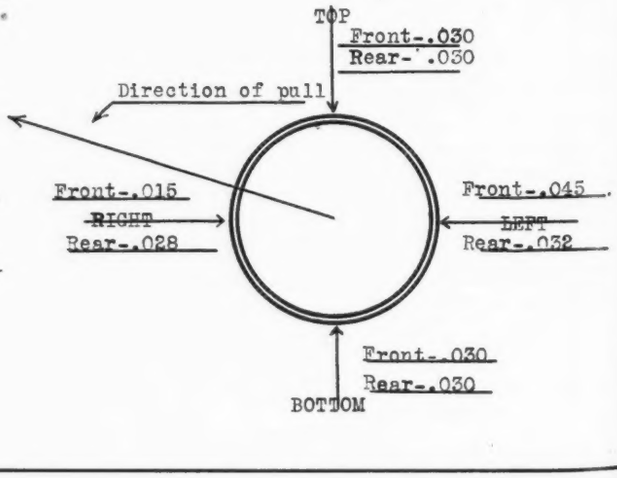
References:

1. Modern Marine Electricity, Smith, Cornell Press, p. 207, 208, 235-250.
2. Troubles of Electrical Equipment, Stafford, McGraw-Hill, p. 14, 15, 21.

Next month: Load Center Unit Substations, presented to April meeting, EMEA of So. Calif., by W. H. Schiek, General Electric Co.

Below: Drawings to indicate points at which the air gap should be checked. At right: suggested chart for keeping a record of the clearance measurements derived from tests





Short Cuts

Engenuity overcomes problem of isolation

Used to keeping a good stock on hand and employing ingenuity to meet unusual problems because of an isolated location, far from sources of supply, Rowley Brothers Electric Motor Co., at Casper, Wyo., should be able to weather the war and keep equipment in that region running better than ordinary. Marc Rowley, manager, has always found it advantageous to keep a large stock of wire and parts on hand. Casper, Wyo., is comparatively remote but it has considerable industrial business from nearby oil fields.

The tree-type rack shown above holds magnet wire for rewinding jobs. Wire is fed direct to the coilmaking lathe

An ingenious tree type of rack, shown in the illustration, was built in one corner of the shop upon which to keep spools of magnet wire for various rewinding jobs. Magnet wire can be fed from this rack directly to the coilmaking lathe designed by Rowley from a Chevrolet transmission, operated by a variable speed motor. The transmission provides further ranges of speed above those available from the motor.

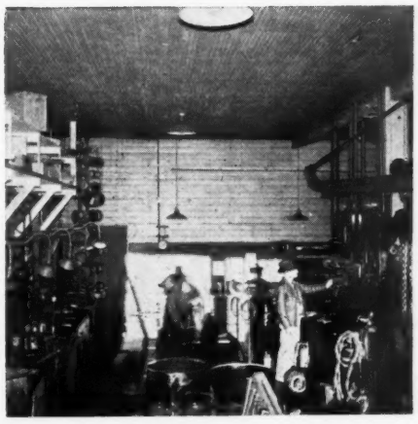
An ingenious wrinkle which saves time and calculation has been to tape a standard rpm speed indicator to the shaft of the coil-winding lathe. Old coils are unwound and the number of turns noted on the indicator. To rewind, the transmission is reversed and the same number of turns is wound back on the coil. This method is more accurate than the familiar one of weight of wire.

Another device made in the shop is one for shaping bar copper for large size windings. It is adjustable as to size of bar that it accommodates and as to centers and turns. Although the device took some $70 in labor to fabricate in the shop, it has paid for itself many times over in speeding the rewinding of large coils.

Instead of an overhead crane, a crane arm has been set up extending

from one of the supporting pillars. Its capacity is 1½ tons. Its swing is sufficient to handle stators and rotors of sizeable motors brought in for repair.

The company not only serves the oil industry locally and some adjoining states but sugar refineries, coal mines and many generating plants for dude ranches and other ranches in the Wyoming region.



Above, the arm-type crane and, left, an adjustable device for shaping bar copper for large-sized coil windings

Electrical Safety

Electrical Safety in War Time, published by the Public Relations Committee, International Assn. of Electrical Inspectors, has come off the press and is available in quantities at costs of from 2c to 1½c per copy depending on the size of the order. It is the *Electrical Safety in the Home* booklet revised and brought up to date with special emphasis upon maintenance of appliances and cords for the duration. Changing of fuses and repairing of cords are included. Sponsored by the inspectors' association, the booklet has the value of absence of any commercial interest.

● A SECOND CLASS in fractional horsepower motor repair was completed at the Samuel Gompers Trades School in San Francisco on May 21. The first group of trainees was reported to be employed in San Francisco motor repair shops. Northern California Electrical Bureau cooperated with the trade school in sponsoring the two classes, which are expected to take care of the manpower needs of motor repair shops in the area.

New NEC Supplement

A second supplement to the 1940 National Electrical Code was issued April 1, 1943, and just now placed in distribution by the National Board of Fire Underwriters. It supersedes the previous supplement of Sept. 1, 1942. Incorporated in it are all of the interim amendments to the 1940 edition of the Code, chiefly caused by action taken by the emergency committee of the Electrical Committee. It also contains official interpretations of the 1940 Code as issued by the Electrical Committee.

The interim amendments are to remain effective only during the war emergency, unless otherwise determined by action of the Electrical Committee. In most cases these interim amendments are made to adjust wiring materials to the scarcity or restrictions of critical materials used in the war effort.

● QUALIFIED CONTRACTOR, official publication of National Electrical Contractors Assn., began with its May issue a new service summarizing the various restrictions and regulations pertaining to sale and use of materials, wage and salary orders, labor regulations, procedures and decisions and other regulatory matters. The May issue also contains an article by J. B. Tinling, general manager, Tinling & Powell, Spokane, Wash., *Job Cost Analysis of Electrical Contracts.*

● LUMINOUS PHOSPHATE GLASS is being developed as an illuminant, used somewhat as phosphor powders are now used in fluorescent lamps, according to news from State College of Pennsylvania, where Dr. Woldemar Wayl and Dr. N. J. Kreidl, professors of glass technology, are conducting experiments.

Exterior with signs below awning

LIGHT for a DRUGGIST
fluorescent

Who

Cunningham Drug Stores, Ltd., Robson and Granville, Vancouver, B. C. Design by Gordon Hamm, electrical superintendent and W. J. Lind, lighting service engineer, Canadian General Electric Co., Ltd., Vancouver. Fixtures by Lighting Materials Co., Winnipeg.

The Need

Improved lighting in a modern drug store which had 15 ft. candles average previously.

Conditions

Store 35 ft. long, 23 ft. wide, ceiling height 14 ft., previous lighting equipment six 300-watt incandescent opal glass bowls, chain suspended.

Installed

Reduced ceiling height to 10 ft. 8 in., and installed five continuous rows of twin 40-watt ceiling-mounted fluorescent units, eight units per row on 4½-ft. centers. Units have both lateral and longitudinal louvers, prismatic glass side panels to light the ceiling. Existing wiring was used through careful planning to reduce use of new materials to minimum. The installation was made prior to government restrictions now in force.

Results

Initial intensity 80 fc. After four months burning, 15 hours per day, intensity average 50 fc. Increased wattage 1,000.

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and for a BANK OFFICE

Who

Mount Vernon First National Bank, Mount Vernon, Wash. Fixtures by Seattle Lighting Fixture Co.

The Need

Higher and more evenly distributed lighting intensity for detail eye tasks in accounting and clerical work, as well as more cheerful atmosphere for banking room.

Conditions

Previous installation of luminous bowl incandescent fixtures delivered approximately 10 fc. from 2,700 watts total.

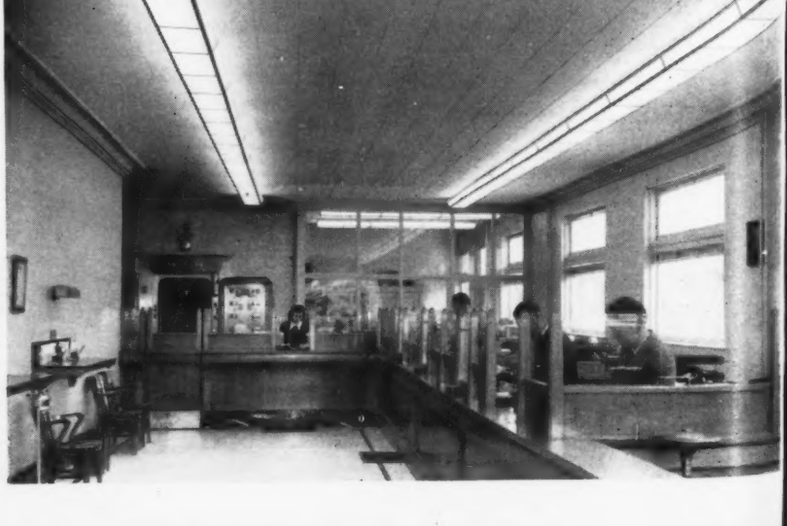
Installed

Thirty-two 3-tube 40-watt fluorescent units, totaling 4,700 watts.

Results

From 55 to 65 fc. average illumination.

Appearance before relighting



War Bond Sales Promotion

Conference develops four-point educational program to push sale through retail outlets

AN educational program to further the sale of War Bonds and Stamps through retail outlets was developed as the result of recent conferences in which S. D. Mahan, associate field director, and other members of the War Savings staff participated with editors of retail trade journals. Four main points are:

1. *Put reasons for sale of War Bonds and Stamps in retail establishments on business as well as patriotic basis.* It is the opinion that business reasons for pushing the sale of Stamps and Bonds have not been given enough emphasis. While no editor wants to throw out or minimize the patriotic appeal, it is felt that a sustained major effort must have a more solid foundation. As one editor puts it, we all like foam on our beer but we must get through the foam into solid brew in order to be completely satisfied.

There are a number of fundamental business reasons why a merchant should be interested in the sale of Stamps and Bonds. These reasons should be hammered home so hard that each merchant recognizes a personal application to his personal problems.

2. *Personnel.* Every retail organization is, at the moment, made up of two types of people. The "in and outers" who might be classified as temporary, represent only a portion of the retailer's headache. The major personnel problem, especially in larger organizations, arises from the fact that key people have a feeling the work they are doing is not an important part of the war effort.

The restlessness of the key people in retail organizations is enhanced because of tremendous publicity given men and women who have left their ordinary jobs and gone into war plants. No one has thought to tell retail salespeople that the work of the riveter and the welder has to be financed—and the man or woman behind the retail counter who, in addition to doing his regular work of serving America, takes on the burden of financing a portion of the production line is just as important to the production line as if he punched a time clock at a factory gate. The sales clerk who sells the Stamp that pays the Lady Welder or Rosie the Riveter is as much a part of the war effort as if she had smudges on her own nose.

A retail organization can be a part of the production line of America—by accepting the responsibility of its opportunity. This may be merely another definition of patriotism put in practical terms, but the appeal has not been brought down to the individual stores or the individual sales person. The continuous successful sale of War Bonds and Stamps can be an outstanding morale building program for any organization.

3. *"Double Duty Dollar" vs. "Tax Dollar".* More should be done to stimulate the thinking of the merchant along the lines of the postwar economic effect of the sale of War Bonds and Stamps to his community and to his own business.

The merchant should be reminded over and over again that the financial security of his community and his store after the war depends on the number of Stamps and Bonds sold in his community.

It should be pointed out that *right now*—after meeting all obligations, life insurance, all living expenses, after continuing a normal savings program through banks, building and loan, etc., after deducting 10% of income for War Bonds, America has left *two billion dollars in change from last month's pay check.* That two billion dollars is not savings—it is from current income. It is being carried in Uncle Sam's pants pocket as small change. That two billion dollars is the *merchant's opportunity* and *responsibility.* He can determine whether that money goes to war as tax dollars or Bond dollars.

A tax dollar never comes back. When a tax dollar is spent it is gone, it never comes back. It may come back temporarily in the form of wages but as surplus over living develops, the surplus goes back into taxes. A War Bond Dollar, however, is a Double Duty Dollar. It not only goes to war—after the war it comes right back home to the same community—to the same pocket from which it came—to be spent over the same merchants counter—*to win the peace.*

A merchant or a merchant's association or a Chamber of Commerce can, from its own figures, estimate the financial and economic condition of their town at the close of this war by comparing normal credit needs with the sale of Bond Dollars. Older merchants remember the last war. By profit standards merchants won the last war. They lost the peace. Peace brought financial difficulty. Whether this situation is repeated, whether we profit from the lessons of the last war, is in local hands.

4. *After the war.* It is felt something should be done to combat the too general feeling that everyone owning "E" Bonds will rush to cash them the minute the war is over, thereby creating general financial difficulty.

It should be pointed out that, when the war is over, individual credit in America will be at its highest peak. The individual American will be out of debt—except for such major purchases as homes, farms and business obligations.

This freedom from debt plus ownership of Bonds will create an unprecedented credit condition. With the Bonds held in reserve, America can buy anything it wants on a credit and pay from current income—without touching its reserves.

The gap between war and peacetime production can be bridged by the sale of enough War Bonds.

Each community has its fate in its own hands.

Booklet Popular

Public interest in food conservation is reflected in the number of requests received by Frigidaire for its booklet of wartime suggestions for the use of electric refrigerators, according to L. A. Clark, Frigidaire advertising and sales planning manager. In a 60-day period, the company received more than 3,500,000 requests for the booklet, which deals with the use and care of any type mechanical refrigerator.

The booklets are being distributed through dealers, appliance stores, utilities, department and furniture stores as a means of building and retaining good will during a period of limited sales. As part of the same service-type publicity program, Frigidaire advertisements currently are devoted to housekeeping hints. Ads have featured instructions for making a general-purpose soup stock; rules for storage and freezing of meats; space-saving suggestions for refrigerator users.

● CONSIDERABLE PRIORITY commercial cooking business is developing from the establishment of in-plant restaurants and cafeterias in such war production areas where overcrowding of restaurants and closing of many during the swing and night shifts is found. The in-plant feeding is considered a means of solving the nutrition problem for many war workers.

A Salesman Rises to His Feet

to speak, if he may, a few words about all this postwar planning from his point of view at the bottom

Anonymous
but well known

IT seems to me, if I can have the floor for a minute, that all we hear about this postwar planning is "opportunity" and "markets," but not much on methods. Wouldn't this be a good time to eliminate some of the evils that have been like cancers on this business in the past?

Of course I know that all of our electrical industry has turned to making war machinery. Most of the "brains" of the industry are spending all their time at it. But when talk starts up everywhere on postwar planning, perhaps it's time for the salesman to put in his two bits worth, too.

The old frontiers of this West of ours have changed a lot. Still our industry is bound to have one of the largest opportunities it ever enjoyed. There are thousands of prewar, low-income families who are enjoying electrical appliances they never knew before. With War Bond money on their hands and their mouths a-watering for a better life, they will all be in the market. Millions of replacement appliances are going to be needed.

Present government controls may stay for awhile. After all they are being placed in effect and policed by our own industrial leaders and some curbs are likely to stay whether we like them or not, it seems to me. Well, if some of them must stay, why not investigate whether something can't be done to the old "dog eat dog" manufacturing and distribution practices.

Can't we figure out, I mean the top men in this industry who are capable, some better means of distributing profits in distribution according to the efforts of those engaged in it?

Where are we to look for dealers and salesmen? Dealers who have turned to furniture and other allied line dealers with large margins of discount are going to have to sell on the old theoretical 40%. Salesmen who have been weaned off of commission and work now on regular salary with a steady pay check are going to be reluctant to go back to the old days of "feast or famine."

I'd hate to think we face another era of exploiting men not familiar to the game. You know, they have a good suit and a car and each one sells his friends, relatives and neighbors and then gradually deteriorates. That may get rid of appliances as it formerly did, but does it build good dealerships? Who wants to see the Indian sign hung on electrical appliances—want ads under the heading, "salesmen wanted" with an assurance "not electrical appliances."

It may be cockeyed, but why not a little peacetime planning by several of the big leaders in this field to arrive at sound quotas of merchandise that can be sold in certain territory, establishment of financially sound dealers, hiring of one good salesman and allowing him to make a good living rather than hire half a dozen mediocre men to starve and cut each other's throats in the process?

We hear a lot of talk about new companies starting to make electrical appliances. With this new competition not much of the past mistakes and research can be charged back on the list price, can it? The field may be highly competitive for both manufacturer and dealer.

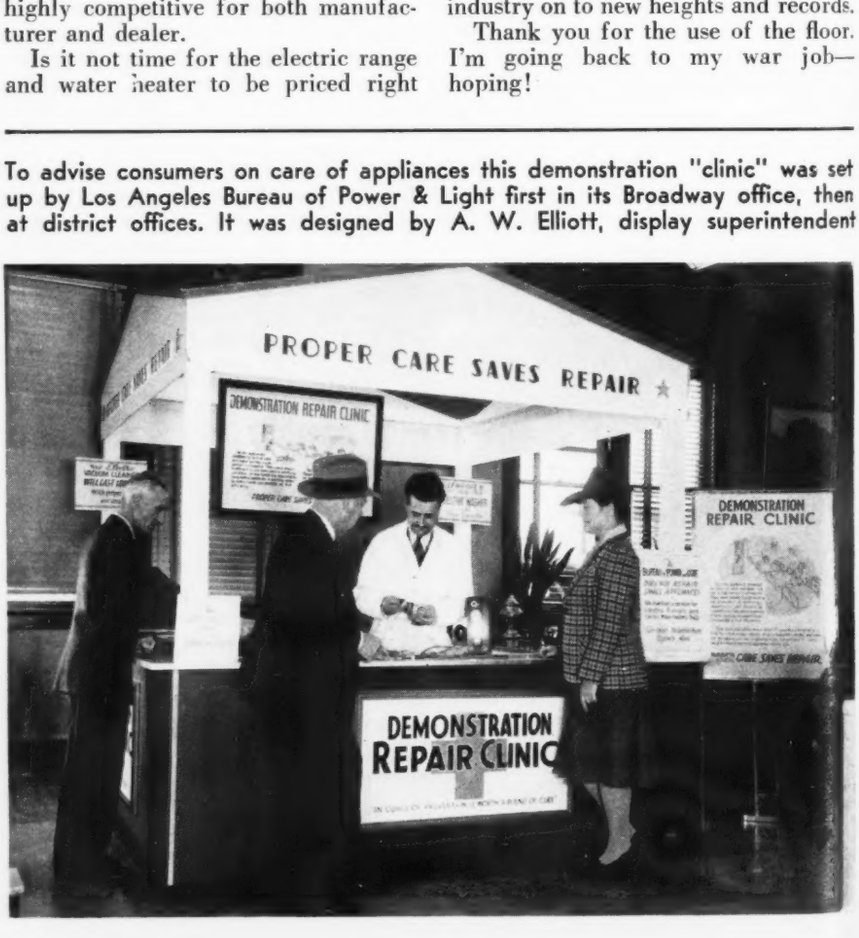
Is it not time for the electric range and water heater to be priced right and allowed to stand on its merits rather than be subsidized by the power company by free wiring and so on? If the public acceptance is what it is claimed, the money spent on subsidization might get more results if spent on bonus money to salesmen, if power companies must spend money. These are just questions. I don't know the answers, but I enter them into this postwar planning discussion as something worth looking into.

Isn't it time the manufacturers tried to find out how much of this so-called "dealer help" material really *helps*, and how much of it is corn? How much of all the fancy trick advertising and gadget selling bait is ever used, and yet think of the tons of it that they all get out and give us a big build-up about in the colossal sales meetings?

As I say, I don't know the answers. After all I am only a salesman—or was until Uncle Sam considered me more essential somewhere else. All I can say looking back over the past is that surely we don't want a lot of what passed as selling and promotion to come back again if we can help it. Now the war has washed all that up in a way we never could have done by ourselves. What a wonderful opportunity there is in this, too, to take a fresh, clean start that will carry this industry on to new heights and records.

Thank you for the use of the floor. I'm going back to my war job—hoping!

To advise consumers on care of appliances this demonstration "clinic" was set up by Los Angeles Bureau of Power & Light first in its Broadway office, then at district offices. It was designed by A. W. Elliott, display superintendent



Electrical Equipment—Weapons and Tools

From miniature motors to mammoth generators, from tiny detector tubes to great broadcasting stations—everything electrical is essential to our war effort

As this editorial goes to press, newspapers and radio news commentators are telling the dramatic story of the blasting of two mighty Nazi power dams. Floods are sweeping down the Ruhr Valley, Germany's most vital munition production center. Two vast networks of industrial activity lie inert, for the great generators that had fed power to hundreds of plants producing war goods for Hitler, today stand idle. This daring raid will go down in history as one of the most, if not *the* most devastating of the entire war. It has destroyed two great sources of power, stopping the wheels in hundreds of plants and throwing into darkness thousands of factories and homes.

This epoch-making raid by the R.A.F. brings home to us the vital importance of our own power resources, those colossal generators from which flows the current that turns the wheels of our great industries, illuminates our factories and homes and runs our electric railways and subways. It makes us realize how dependent we are on electricity and how important is the part of those manufacturers who produce the electrical equipment that makes possible its generation and use.

Beginning with Thomas A. Edison, the inventive genius of electrical manufacturing men has devised more and more efficient ways of generating the current, better and better means of transmitting it and of applying it to do thousands of jobs quicker and better.

The products of electrical manufacturers have become so completely an essential component part of every industrial, business and domestic activity that our economy and our war effort could not go on without it.

In days of peace the laboratories of our electrical industry gave us radio, fluorescent lighting, infra-red drying, precision process-control, telemetering, split-second circuit breakers and many other things that border on the miraculous.

Today their facilities and their genius are devoted to an all-out war of wits with Axis scientists and production men.

Electricity plays a significant part in this war . . . from the "walkie-talkie" that brings support to hard-pressed outposts, to the mammoth motors on the battleships. While many electrical developments today are cloaked in secrecy, the nation will enthusiastically applaud these electrical manufacturers when the curtain is lifted.

The far-reaching importance of electrical instruments, apparatus and machines becomes evident when we consider that over 350 different electrical items go into combat vessels and that more than 170 go into a fighter plane. Most of these products are distinctly special in nature and are far removed from their civilian counterparts if, indeed, they have such counterparts.

To the civilian, a light bulb is something so standardized that every need can be filled by any nearby dealer. Our armed forces, by contrast, must have at their disposal more than 400 distinct types of lamps. Some no larger than the head of a match, are so brilliant that they flash signals under a tropical noon sky. Others are built to withstand extremely low temperatures, vibration, shock and many other abuses to which they are subjected.

On planes, for example, numerous fractional-horsepower motors are used but the standard industrial motor is not suitable for this service. New records in low weight-per-horsepower had to be achieved involving extensive changes in design and production.

To prevent the light from instrument panels from impairing the vision of night fighters, ultra-violet radiation which activates fluorescent instrument dials was developed. As a result, the pilot may look out into the darkness after reading his instruments without the least effect on his eyes. How many precious air victories can be credited to this one development alone?

But, in general, the story of this industry's war work is much too blurred by military censorship to afford an adequate picture of its contributions. The factories and shipyards that are turning out war matériel tell a more complete story. Many of these have been built during the past two years. Others have gone through a complete conversion process. In every case, large quantities of electrical materials were involved.

In the broadest sense, there are three major jobs which this industry has had to do, in addition to equipping our modern war machine. It has had to supply materials for the vast expansion of our industrial system, keep every plant fully maintained, and provide the necessary equipment for the vital power and communication fields.

More than $1,900,000,000 was spent for new industrial construction in 1942, and of this about 7% or $140,000,000 was for electrical materials. New machine tools and other production equipment required an additional $350,000,000 worth of electrical products. The conversion program called for another $145,000,000 of electrical apparatus and supplies.

This total of over $600,000,000 in itself would have staggered the electrical industry in a peace-time year. Yet, this record-breaking production was essential and had to be superimposed upon the direct requirements of the Army and Navy.

Industry depends upon electricity. Consider for a moment the effect of modern lighting upon war production. Industry enjoys levels of illumination and color quality that were undreamed of ten years ago. As a result, midnight shifts operate at daytime efficiency. As a matter of fact, many of the more modern plants have no windows at all.

Then there is maintenance. The failure of one single motor or feeder will stop a production line. Electrical manufacturers have had to stand at all times ready to

supply the heavy demand for the maintenance and repair parts that keep our industrial machine operating at top speed. Excess loads, 24-hour schedules and inexperienced production hands combine to shorten the lives of electrical equipment.

Electrical manufacturers have had to supply the greatly expanded needs of our power and communication systems.

New construction of all sorts — war plants, cantonments, war housing — has created a formidable need for additional capacity. Every element in our domestic economy has called for increased communication and power services. All this had to be superimposed upon the vast demands of our armed forces. The magnitude of this task is obvious but it is being successfully accomplished. Every old installation is functioning smoothly and every new one has been ready to function on exact schedule. There has been no failure either in our power or in our communication. Part of the credit for this performance belongs to the hundreds of manufacturers who delivered their products when and where they were needed.

This was not merely a problem of increasing production. These manufacturers had been depending on rubber, copper, aluminum and steel — all highly critical materials. For much of their non-military production they suddenly had either to find substitutes or practice the utmost economy and ingenuity.

Solutions to many problems were quickly found. Lighting manufacturers greatly reduced their use of steel by designing efficient, non-metallic reflectors. Wire and cable manufacturers expanded their use of synthetic insulation in place of rubber and they promoted the use of higher distribution voltages so that every ounce of copper would work more efficiently.

Steel is essential in apparatus that operates magnetically. There is no known substitute. But marked economies in its use have been achieved through the development of new alloys that are of increased magnetic efficiency. As a result, motors and transformers now consume substantially less steel than did units of equal capacity a year or two ago.

Electrical manufacturers have given our industries numerous new production tools. Infra-red heating tunnels, for example, have drastically reduced the time involved in production drying . . . in some cases from hours to minutes. High-frequency induction-heating has been spectacularly successful in the forging, brazing, hardening and casting of ordnance. Modern welding equipment makes possible speedy production with inexperienced labor.

America's production lines are being patrolled by electrical devices which eliminate human error. One million volt X-ray equipment looks through castings and points an unfailing finger at defects. An electronic flaw detector tests nonferrous drawn-metal tubing for imperfections. Other electronic devices are counting and sorting the products of thousands of war plants. Precision controls regulate all sorts of processes, from aluminum production to armor plate annealing.

These are but a few of many examples of the way in which the magic power of electricity has been harnessed to the war effort. Back of every development there is at least one electrical manufacturer — more often many — who have pooled ideas and methods with no thought of royalties or dispute over cost allocation.

No story of the electrical industry would be complete that did not pay tribute to those manufacturers who have dropped their normal lines in order to produce special war products. Many appliance manufacturers fall in this group. When war came, they did not stop to argue that civilian morale and big pay checks would demand a continued supply of their products, instead they quickly shifted to the production of war matériel and today they are deep in the manufacture of machine gun parts, aircraft sub-assemblies, and even gas-mask fabric. They have had to abandon their hard-won markets for the duration; but they are contributing mightily to permanent peace and a more prosperous world to which they will return when the guns are silenced.

This great industry has increased its production threefold in two years — $2,500,000,000 in 1940 to $7,500,000,000 in 1942. It has done this with all the zest of youth, for this is a young and a pioneering industry. Few companies in this industry are fifty years old; the majority are much younger. Top management in general is young, too, and many outstanding technical developments have come from the brains of men just a few years out of college.

The results of all its intensive intelligent work can be found in every factory, on every battlefield and ocean, and even in the flak-spotted air over Berlin. In a sense, the electrical manufacturing industry stands beside every soldier and every sailor as he goes into action. It has a place of honor it richly deserves.

And when this war passes into history, as it surely will, our soldiers and sailors returning to peace-time jobs, will find a life greatly enriched by electrical developments that were undreamed of yesterday.

This is the twelfth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

Manpower

Controls applied as materials regulations settle into stride

MANPOWER stole the show from materials on the regulation front during May and is likely to dominate the June scene as well. Behind schedule as it is, manpower, as a factor in war production, has to be brought under as careful allotment as materials to prevent hoarding on the one hand and scarcity on the other and promote efficiency everywhere. Another phase of manpower which will not be touched here but which will become acute with the passage of the pay-as-you-go tax is that of further yeasty wage increase pressures.

Freezing of manpower to its job was ordered April 18. To make that effective the various areas of the War Manpower Commission seemingly have set up procedures somewhat at variance in detail but designed to accomplish the same ends.

In general, any large or medium plant may set up a committee with representatives from labor and management to pass upon employees' requests to quit for other jobs. Employers are given 24 hours in which to persuade the employee to remain before the question is referred to such a committee. In cases where amicable agreement is not reached, the committee judges the application on the basis of the freezing order. An appeal may be taken to the area WMC itself by an employee. Chiefly the process is such as to discourage change of jobs and to bring to the employer's attention minor causes of dissatisfaction which may be causing a desire to quit.

In such industries as the construction, with its relatively high turnover and usually small steady crew, supplemented as need be by workers hired by the day or week, an industry committee set-up has been permitted in some areas. In these cases the committees are made up of members of the contractors and union and clearance forms are handled through union headquarters. The alternative is that clearances be made by the U. S. Employment Service, already overloaded with detail and thus slow to process applicants.

San Francisco Bay region and Salt Lake City were moved up into the group 1, or acute labor shortage areas during the month and Los Angeles is said to be next. San Jose was moved into the group of cities in which an acute labor shortage could be expected in six months. The Group 1 list now includes Las Vegas, Nev., Portland, Ore. and Vancouver, Wash., San Diego, San Francisco Bay, Seattle-Tacoma-Bremerton, Cheyenne, Wyo., Ogden and Salt Lake City.

Professional and technical men and women, the WMC announced, can now be placed through the U. S. Employment Service. The list includes accountants and auditors as well as engineers and employment, personnel, production or industrial managers.

Wire prices were allowed to increase to adjust to the April price increase allowed crude rubber.

Warehousing charges were allowed to be added to the ceiling prices of mechanical refrigerators frozen by WPB when sold under priority regulations, the OPA ruled. Allowable charges are one per cent per month between February 1942, or the date when the refrigerator was placed in the warehouse, and Sept. 13, 1942, plus $5 per unit between May 1 and Dec. 31, plus $10 per unit after Dec. 31.

Price ceilings for any newly-developed product not manufactured or sold before March 1942, may be derived. OPA has announced, by means of a formula and applied for at a field office of OPA within 10 days of being placed on sale. This was necessary because large stocks of unsalable automobile radios were purchased, changed over to house-current operation, mounted in cabinets and offered for sale at inflated prices.

WPB clarified the definition of armored cable, the manufacture of which is prohibited by L-165. The definition now includes armored ground wire, or armored conductors whether bare, insulated, lead covered, cloth or varnished cambric or paper covered. In other words, "no soap."

An AA-4 is now necessary for commercial purchasers of lamps of any kind. Under CMP Reg. 5, an automatic AA-5 was extended to commercial purchasers for maintenance and repair. This permitted them to absorb the entire output of lamps at the expense of domestic users. This move is to protect the limited supply for domestic users.

Five radio parts have been standardized by L-293, effective July 1. These are dry electrolytic and fixed paper dielectric condensers, power and audio transformers and reactors.

Manufacture of some portable lamps was released by an amendment to L-33. Manufacturers may produce lamps from parts which had been wholly or partially fabricated by Dec. 10, 1942. Production may continue until July 15, and then be stopped again. The amendment applies to wire cord and to silk for shades in the manufacturer's inventory.

PD-1A applications up to a limit of $500 may now be processed at field offices, effective May 8.

Revisions to CMP Reg. 5, dealing with maintenance, repair and operating supplies will bear study. The schedules have been revised and ratings changed from AA-2x to AA-2 in some cases. Provisions for minor capital additions have also been changed. The ratings and symbol assigned to a particular business may be extended to its branch offices and other facilities, too, under another interpretation issued May 20.

Certain critical common components, 23 of them, used in common in power, ship, rubber, high octane gasoline, aluminum, magnesium and steel production, are due to be scheduled by WPB soon, as a means of keeping the flow of them in tune with their requirement. Claimant agencies will submit schedules for these as far in advance as possible. WPB will then try to reconcile these with requests, diverting business from one manufacturer to another in order to insure delivery on time.

Another plan which will affect utilities and contractors building power lines is one in which available lists of conductor stocks will be scanned for conductor that may be used on transmission lines for which approval and ratings are being negotiated. Regional officers of the redistribution branch will freeze such stocks for such jobs.

D. A. Smith, Graham Reynolds Electric Co., Los Angeles, has been appointed by WPB to the electrical wholesale distributor industry advisory committee, the only member west of Chicago.

● AN OVER-ALL area coordination, with local committees to handle clearance procedure for the industry, is being set up in northern California under California Area No. 1, War Manpower Commission. Participants are the International Brotherhood of Electrical Workers headquarters and locals and the Electrical Contractors Assn. of Northern California and a number of local contractors associations.

Nominated to the employers committee for the area were T. L. Rosenberg, Oakland, president of the contractors association; George Abbett, president of the San Francisco association; J. D. O'Connor, Sacramento; Roy Butcher, San Jose; Tom Drury, Bakersfield; and Tom Robinson, Fresno. The area committee is merely advisory to the WMC, but assists the local committees to form. IBEW members had not been nominated at press time.

Dealer Meetings

OPA officials interpret appliance rulings

ELECTRIC ranges, such as can be found somewhere in the theoretical national inventory of them, are still to be procured through WPB procedure on priority. But gas and hard fuel stoves in limited, rationed quantity will be made available from a restricted group of Class C manufacturers, upon presentation of a local ration board certificate. This was the message brought to dealers of the West last month in a series of meetings addressed by OPA officials.

Hope that similar procedure might be later developed for a limited manufacture of electric ranges, washing machines, vacuum cleaners and electric irons was not satisfied by these meetings, although the question was often asked. So far the program applies only to stoves, and to replacement of equipment as it wears out completely. Only liberalizing factor is that a stove that cannot be repaired on the premises is classed as "beyond repair" and may be taken in trade for a new stove, with a certificate, if it is repaired and made available as a second-hand stove.

Dissemination of this program was made the occasion in northern California for the calling of a series of dealer meetings in San Jose, San Luis Obispo, Salinas, San Francisco, Oakland, Stockton, Fresno, Bakersfield, Visalia, Sacramento, Marysville, Red Bluff and Santa Rosa. About 1,500 electrical, hardware, furniture and other dealers and their department heads attended the 13 meetings.

Typical meeting was headed by a local chairman and arranged for by a local committee. The series was sponsored by Pacific Gas and Electric Co., Coast Counties Gas & Electric Co., Southern California Gas Co., Northern California Electrical Bureau, Gas Appliance Society and the Western Furniture Exchange and Merchandise Mart.

First speaker in most cases was either Frank Runyan, vice-president and general manager, or A. Cameron Ball, business manager of the Mart. Both announced the forthcoming annual summer market at the Mart in San Francisco and told of its value as a source of sound advice and counsel as well as of remaining available merchandise. They also gave a long-range view of some of the merchandising developments of the future when the war production facilities are converted again to civilian goods with the stimulus of light metals, new designs, plastics and other revolutionary factors.

In four meetings, San Jose, San Luis Obispo, Fresno and Bakersfield, George Tenney, editor ELECTRICAL WEST and chairman of the educational section, NCEB, talked of the place cooperation must play in developing the postwar market.

Either Bert Reynolds, manager of domestic sales, O. E. Rush, dealer coordinator, of PG and E, or H. H. Courtright, president, Valley Electrical Supply, next spoke on the difficulties, responsibilities and opportunities of the utility company in the present-day situation. As difficulties they told of paper work, personnel shortage, public relations problems. Under responsibilities they touched upon those of maintaining adequate supplies of gas and electricity and of helping to keep dealers going. As to opportunities for the future, to be shared by the entire industry, they told of the obsolescence of appliances, the tremendous replacement market building up, the coming of new devices such as television.

Oliver F. Johnson, field liaison chief, stove rationing section of the Office of Price Administration attended most of the meetings as the final and chief speaker. In some meetings the local stove rationing representative handled this part of the program. In introducing the subject, Johnson mentioned that the rationing program had been developed by an industry council of 40 business men, of which Runyan was a member and Lyle Allen, of Stanford University was chairman of the stove division of OPA.

Turned over to questions and answers, the meetings all developed lively discussion. If the exuberance of the big sales meetings of the past was lacking, and the ranks had thinned because of war mortalities, the objective of the series was realized. That, according to Bert Reynolds, was to bring together the dealers who used to meet often on promotions, and to assist them in meeting the troubles, the new kinds of trouble, they now have in greater measure than before.

Women of Honolulu are finding answers to their wartime food problems at "Health for Victory" clubs sponsored by Westinghouse and the Hawaiian Electric Co. Left: Mrs. Adrian Engelhard, club member, consults Hawaiian Electric Co. home economists Erma Meeks and Yuki Sugai. Extreme right: Miriam Jackson Emery, director of the utility home service department, gives pointers on planning nutritious menus for war workers at a group meeting

PCEA Panorama

Edited by Mary Shoop

Electriquiz

Fred B. Doolittle, electrical engineer, Southern California Edison Co., Los Angeles, is the author of this interesting quiz.

1. Electric power bills often include a "readiness to serve" or "demand" charge. Is the amount of this charge measured in terms of (a) power or (b) energy?

2. Power may be measured in which three of the following units? (a) horsepower (b) volts (c) watts (d) kilowatt-hours (e) amperes (f) kilowatts.

3. Work is measured in terms of energy. Energy may be measured in which two of the following units? (a) watts (b) horsepower (c) foot-pounds (d) kilowatt hours (e) kilowatts.

4. At 100% efficiency, a one horsepower motor could raise a 1,000 lb. weight 330 ft. in 10 minutes. A 10-hp. motor could accomplish this task in one minute. Which motor would use the more energy?

5. If, as in question four, a 1-hp. motor can do as much work as a 10-hp. motor, under what circumstances would the larger motor be required?

The answers are on page 134.

Planning Report

Each member of PCEA has received a reprint of the association's planning committee report which appeared in the April issue of ELECTRICAL WEST, as the result of recent action of the association's board of directors. This will give each person a convenient copy of this important document to study, file and refer to whenever desired.

The planning committee's review of the present and postwar picture is not designed as a definite plan for activities, but rather as a variety of suggestions and proposals from which an individual and a company may develop a pattern best suited to particular operating conditions. Regimentation in planning is as contrary to the American way as regimentation in any other field, and it is the committee's purpose to stimulate rather than dictate individual thinking along this important channel.

Officers Chosen at June Conference

Angle to head association for coming year

OFFICERS of the Pacific Coast Electrical Assn. for the term beginning July 1, 1943, and ending June 30, 1944, were chosen at the annual meeting of the association, which was held June 2 in conjunction with the War Problems Conference at the Hollywood Roosevelt Hotel. The newly-elected executives were presented at the northern War Problems Conference on June 9 at the Fairmont Hotel, San Francisco.

They include the following prominent members of the Western electrical industry:

President—Frank C. Angle, San Francisco manager, Allis-Chalmers Mfg. Co.

Directors to succeed those whose terms expire June 30—Albert Cage, general manager, California Electric Power Co., Riverside; J. O. Case, president, Quality Electric Co., Los Angeles; D. E. Harris, vice-president, General Electric Supply Co., San Francisco; W. C. Mullendore, executive vice-president, Southern California Edison Co., Los Angeles; K. M. Ryals, Stone-Ryals Electric and Mfg. Co., San Francisco; M. G. Sanders, assistant to the president, Central Arizona Light & Power Co., Phoenix; D. D. Smalley, general superintendent, San Joaquin Power Division, PG and E, Fresno; George C. Tenney, editor, ELECTRICAL WEST, San Francisco; F. A. Tracy, president, Sierra Pacific Power Co., Reno.

Committee Appointments

New members of the code and ordinance committee of PCEA are Al Meyer, president, Leo J. Meyberg Co., San Francisco; B. M. Tassie, manager, Pacific district appliance sales, General Electric Co., San Francisco; and J. F. O'Donnell, assistant sales manager, electrical appliance division, Westinghouse Electric and Mfg. Co., San Francisco. These executives bring to this active PCEA committee wide experience in the appliance field which will be of value in the committee's promotion of the unsafe electrical appliance ordinance.

Who Am I?

I was born in Danville, Va. After preparatory schooling there, I attended Johns Hopkins Academic School and the University of Wisconsin, receiving a B.S. degree in electrical engineering from the latter. Three years later I received an M.A. degree. After a year with the San Antonio Gas and Electric Traction Co., I entered the service of the Oakland Gas, Light and Heat Co. in 1904. I designed substations, superintended their construction, and engaged in general distribution work until 1906, when I was transferred to the San Francisco office in the electrical distribution department. Who am I?

In 1910 I was appointed engineer of the distribution department for all the system, except San Francisco, Oakland and Sacramento. In 1912 I was made engineer of the entire system of the Pacific Gas and Electric Co. I held that position until 1918, when I became engineer in charge of the San Francisco division, directing engineering operations of all properties, including the steam plants in the division. In 1921, I resumed my duties as engineer of electrical distribution, the position I now hold. Who am I?

I have been a member of PC EA since its inception. I have served on the board of directors for one term, and as chairman of the engineering section for another. I am affiliated with Tau Beta Pi, honorary engineering fraternity, the Olympic Club and am a past president of Concordia Argonaut. I am married, have three children, reside in San Francisco, and my name is: See page 134.

The 1943 edition of this ordinance already has been adopted by the Southern California cities of Santa Monica, Monrovia and Covina, and is up for consideration in a score of other municipalities. It also has been submitted to the League of California Cities for approval, and there is every indication that the league will endorse it and recommend its adoption by its members.

Inspectors Groups Debate War Problems

Montana and Utah chapters IAEI study changes in Code, discuss use and conservation of materials

HOMER MORTON'S experience of the past year with bomber bases gave him a bombardier's point of view, and from it he proceeded to bomb the advisory panel at the Montana Chapter, International Association of Electrical Inspectors annual meeting at Great Falls, May 1, with questions on the interim amendments to the Code. This open forum discussion climaxed an evening and a full day of intensive discussion, April 30, May 1, for the war conference and third annual inspectors school, over which R. R. Grant, city electrical inspector, Havre, Mont., chairman of the chapter, presided. Morton is commercial salesman, Montana Power Co., Great Falls.

This open forum session was considered the highlight of the conference and copies of the questions have been sent to IAEI to be used by other chapter meetings as a means of acquainting inspectors and contractors with the changes in the Code brought on by war shortages and restrictions of critical materials. Answering the questions were L. B. Johnson, General Electric Co., Salt Lake City; A. W. Dunham, Anaconda Wire & Cable Co., Denver; C. H. Kirk, Montana Power Co., Butte; R. C. Setterstrom, also Montana Power, Butte; C. A. Palmquist, Palmquist Electric Co., Helena; H. K. Dickinson, Montana Power, Great Falls; H. F. Gemberling, Montana Power, Great Falls; and A. L. Wiegenstein, Westinghouse Electric Supply Co., Butte.

But this lively open forum was not the only attribute of the conference to commend it. A strong supporting program of informative talks on various phases of present-day wiring and inspection was presented. The meeting opened by a welcome from H. E. Chambliss, chairman of the arrangements committee (Montana Power, Great Falls), who said, "Most of the changes in the 1940 Code were made in order to conserve manpower and critical materials but, before these new rules can be properly applied, we must know where and how they can be used with safety, and what materials are available. For this reason alone it is obvious that electrical inspectors should study and become informed on these changes if they expect to be able to discharge efficiently their many duties and obligations in winning the war."

In his absence a letter from W. R. Volheye, president of the Northwest Section IAEI was read. In it he discussed the difficulty inspectors will face after the war in bringing up to recognized peacetime standards the wiring installed with substitute materials and "for-the-duration-of-the-emergency" methods. He wondered if a rubber insulated grounded circuit conductor would ever again be used.

"It is going to be difficult to explain the use of certain emergency materials in defense housing projects where the houses are constructed of flimsy material and grouped so close together that they present a serious fire hazard, when the use of this same material is prohibited in other buildings that are more favorably located and where fire fighting facilities are adequate," he said, concluding with the advice, "we can render a worthwhile service to the public by being very careful in our inspections and by looking upon all wiring installations as permanent even though they are classed as temporary for the emergency." Volheye is state electrical inspector of Oregon.

How priorities affect the electrical industry in general was explained to the meeting by R. E. McDonough, commercial sales manager of Montana Power. He defined the various types of order—M, L, P and the new CMP program. C. H. Kirk, superintendent of electrical distribution, Montana Power Co., Butte, discussed in detail how applications for utility service may be made by farmers and for housing projects. R. C. Setterstrom, electrical engineer, Montana Power, spoke of regular inspection of motor and control equipment as a means of preventing breakdowns to equipment that is nearly impossible to replace.

The main address of the evening session, however, was that of Austin Dunham, district manager, Anaconda Wire & Cable Co., Denver, *New Types of Building Wire and their Applications*. It was the same talk given at the Denver meeting of the Rocky Mountain Chapter, March 26, (see ELECTRICAL WEST, May, p. 76) and the Utah Chapter, April 28, and will be reprinted in next month's ELECTRICAL WEST.

Herbert G. Ufer, western superintendent, Underwriters' Laboratories, Inc., Los Angeles, opened the Saturday morning session with a thorough discussion of how carefully the laboratories test the new materials in the establishment of emergency standards. He also described many of the other wartime activities of the laboratories.

F. D. Weber, secretary-treasurer, Northwest Section IAEI opened the afternoon session by telling of the organization and field of activities of the association. He amplified upon the objectives of the organization, explained its classes of membership and told of the bulletins and information sent to members.

Electrical Specifications for Emergency Housing were described by Lester B. Johnson, district representative, General Electric Co., Salt Lake City. He urged reading of the WPB war housing manual, told of forms that require complete listing of materials, limits set on number of outlets and use of iron instead of copper in some wiring devices. He cautioned to watch for overheating and also soldered connections since new solder contains less tin and requires higher melting temperature.

The previously described open forum absorbed the remainder of the program, at the end of which came election of officers. Succeeding R. R. Grant of Havre, J. R. Crawford, assistant city electrician, Butte, was elected chairman; Charles McDonald, first vice-chairman; Ed Henen, electrical inspector, Great Falls, second vice-chairman; and J. G. Clune, Chinook Electric Co., Chinook, Mont., re-elected secretary-treasurer. On the executive committee are R. R. Grant and L. B. Johnson. Committee appointments made by Crawford were: Art Wells, public relations; R. McDonough, membership; C. Palmquist, legislative; and H. Morton, code clearing house. Registration was 83 members and guests.

Utah Conference

SURROUNDED as Salt Lake City is by military establishments and with headquarters for Western defense and for the Engineer Corps located there, is was natural that electrical construction for such army installations be the center of interest at the second annual meeting and wartime conference on code and construction problems, held there on April 28 by the Utah Chapter, International Association of Electrical Inspectors. Reuben E. Baxter, deputy electrical inspector, Salt Lake City, chapter chairman, presided.

Besides the talk by F. D. Weber, secretary-treasurer, Northwestern Section IAEI; the letter from President W. R. Volheye; the paper on Underwriters' Laboratories, Inc. war work given by H. G. Ufer, western superintendent; the address by Austin Dunham, Denver district manager of Ana-

Fred D. Weber, secretary-treasurer, Portland, and J. Hyde Stayner, vice-president, Salt Lake City, Northwest Section, of the electrical inspectors

conda Wire and Cable Co. (which will be published in full in a later issue); all of which are reported in the preceding account of the Montana Chapter meeting, there were several other speakers to fit the program into Utah's particular wiring situation.

Dr. T. C. Adams, regional director of industry relations, War Production Board, predicted that many more items would be added to the long list of controlled materials before the war is over, urging greater care in use of materials and counseling against discouragement in the still tougher times to come.

Kimball Vance, electrical contractor, told how electrical contractors are now doing in 60 to 90 days, work which formerly took a year or more to complete. He described a manpower pool set up by local contractors to make the best use of available men in order to speed the immense volume of local construction.

L. B. Johnson, General Electric Co., described new fluorescent starters, reflectors and equipment using less materials, told of installation precautions for hazardous and for wet locations.

R. W. Kimberlin, district manager, Graybar Electric Co. discussed problems of supply of materials and how wholesalers are meeting the unusual demands made on them.

Lt. Col. Ben Benioff, chief, repairs and utilities branch of the Salt Lake district, U. S. Army Engineer Corps, paid tribute to the contractors and inspectors of the region for cooperation in building the large amount of war construction in the territory. He also described the variety of work which his corps is called upon to do.

L. John Christensen, industrial arts teacher, West High School, discussed the changes in the National Electrical Code and cautioned the need for adherence to its minimum safety standards despite the growing lack of materials. The afternoon session had been presided over by D. J. Wolters, chief inspector of Salt Lake, vice-chairman of the chapter.

The evening dinner session was an all-industry affair, presided over by Leland B. Flint, president of the Electrical League of Utah. H. G. Ufer spoke briefly again, complimenting the chapter and J. Hyde Stayner, vice-president of the Northwest Section, who also had the meeting arrangements in charge.

J. F. McAllister, secretary of the league and resident sales manager, Utah Power & Light Co., was the evening's principal industry speaker, describing the power pool formed in the region to take care of war needs. He ended by picturing the opportunities of the postwar period in appliances and the wiring to serve them. Ralph B. Jordan, managing editor of the *Desert News* ended the conference by reciting experiences in the Pacific war zones.

Northwest Section IAEI has scheduled its annual meeting at the New Washington Hotel in Seattle, August 26 and 27. Committees include: Chairman—R. A. Walker, Puget Sound Power & Light Co.; At Large—H. G. Anger, Puget Sound, V. B. Wilfley, Westinghouse Electric & Mfg. Co.; R. J. Larrabee, Underwriters' Laboratories; Entertainment—James W. Ferguson, City Light; Exhibits—E. E. Lee, Seattle Building Department; Golf—Grover C. Burke, City Electric & Fixture Co.; Finance—R. U. Muffley, Puget Sound; W. S. Gaunt, IBEW Local 46; O. A. Alderman, McGraw Electric Co.; C. D. Ries, G-E Supply Co.; J. J. Agutter, J. J. Agutter & Co.; Hotel—T. M. Widrig, Trumbull Electric Mfg. Co.; Ladies' Entertainment—L. B. Benson, Anaconda Wire & Cable Co.; Reception—T. S. Wood, T. S. Wood Co.; Publicity—R. D. Horning, Seattle Electrical Contractors Assn.; Registration—C. W. Allison, Puget Sound; Transportation & Trips—J. D. Gawne, City Light; Secretary-Treasurer—F. D. Weber.

Dick Wolters, vice-chairman, Reuben E. Baxter, chairman and C. F. Grant, secretary-treasurer of Utah Chapter

A program keyed to the current, everyday, changing conditions under which the electrical inspector must work is being developed for the annual meeting of the Southwest Section, International Association of Electrical Inspectors, at Los Angeles, Aug. 30-31-Sept. 1, according to Harold L. Gerber, chief inspector, San Francisco, secretary-treasurer of the section and in charge of its program. Speakers from the War Production Board, shipyards, war production plants and manufacturers of electrical equipment will bring the inspectors up-to-the-minute information of this character. Full details of the program are expected to be completed in time for announcement next month.

Lt. Comdr. L. M. Watson, formerly with Westinghouse Electric & Mfg. Co., spoke before the Los Angeles Electric Club on May 3 at a special meeting designed to acquaint industrial leaders with their wartime responsibilities for plant protection. Speaking on *Navy Security*, Watson explained how the Navy provides the necessary protection for internal defense and passive defense of its facilities ashore and afloat.

Pacific Division, National Electrical Wholesalers Assn., will hold its war conference at the Santa Barbara Biltmore Hotel, June 17-19. Discussions will include the manpower shortage, the 48-hour week, the Manpower Utilization Plan, the wage freeze order, PD-1X, the Control Material Plan.

Third Dimensional Seeing and *Paint Multiplies Light*" were presented to the Electrical Maintenance Engineers Assn. of Northern California at the May 27 meeting, San Francisco. Speaker was Roy Emory, of the Dupont Co., who presented these two moving pictures. A. F. Cazin, Otis Elevator Co., presided.

ELECTRICAL WEST

McGRAW-HILL COMPANY OF CALIFORNIA
68 POST ST. SAN FRANCISCO

The all-industry magazine of progress, established 1887 and incorporating the "Electrical Journal," "Journal of Electricity, Power & Gas" and "Journal of Electricity." Contents Copyrighted

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Non-Electric Rationing

OF THE 3,000,000 plus stoves and heaters to be rationed by OPA during the next year, not one is electric. Why should all of these cooking and heating appliances be fueled by wood, coal, gas or oil? There must be a reason. OPA glibly passes over the omission with the statement that "electric stoves still come under the supervision of WPB—they use more critical materials you know." Here in the West where almost one housewife in seven cooks with electricity, that's a poor excuse for a dealer to hand out when a customer comes into his store looking for a replacement for a worn-out electric range.

We think the reason is more deep-seated than that. The electrical industry never has had a spokesman in Washington to look after its interests. There is no one in that community of pressure groups and special interests who apparently cares a hoot whether our industry's customers ever see a new electric range—at least for the duration. The utilities have men at the nation's capitol but they are vitally concerned with problems remote from electric cookery. The same holds true for men connected with electrical manufacturers. There just isn't anyone whose special job it is to see that the over-all interests of the industry get deserved attention. Until there is (and we have advocated such a step for years) the public will have to cook with gas or coal or oil or wood.

State Authority Wanes

SINCERE believers in the righteousness and effectiveness of state regulation of public utilities must look with apprehension upon the steady inroads of federal regulation. Most alarming recent development is the U. S. Supreme Court decision in the Jersey Central-Federal Power Commission case. The court ruled that Jersey Central was engaged in interstate operations because it wholesaled power to another company which, in turn, sold across state lines. The reasoning back of the decision is involved; the point of law on which it hinged, minor. Yet if allowed to stand, the decision virtually nullifies state regulation of any company, which through interconnections, ties in with another engaged in interstate business. This never was the intent of Congress. However, until Congress clearly defines the jurisdiction of state regulatory bodies and federal agencies with conflicting authority, it will be the law.

Redtaped to the Limit

ONE of the evils of bureaucracy is paper work. Centralized control such as some bureaucratic agencies practice simply increases the volume. But that is only half the story. It wastes time and labor; it impairs efficiency; and worst of all, it interferes with the maximum war effort. For proof contemplate the experience of this Western power company.

California farmers are being asked to increase production 25% as part of the Food for Victory program. This requires more irrigation, more electric pumping. This particular power company has filed more than 1,000 applications with the WPB for priorities to serve such agricultural installations. Recently studies were made of 50 cases chosen haphazardly from the list. Confirmed were certain beliefs which up to then had lacked proof. The average period for securing approval was 87 days from the time the customer walked into the office seeking service. Reason for the delay—excessive paper work. Actually the man-hours of paper work involved on the average application exceeded the hours of labor required to erect the facilities to serve the customer! A department that in years prior to the war had handled more applications expeditiously and efficiently with four people, today requires sixteen to fill out the papers for a lesser number. Typical of the cases was one in which the time cost of paper work was $18.30 while the materials for which priorities were sought cost but $6.70.

Most significant fact of all is that of the 1,000 or more applications submitted, only three were disallowed. And one of these was submitted at the insistence of a customer with the knowledge that it would not win approval.

The cure for all of this waste is obvious. Decentralize authority. Further, place responsibility for compliance with regulations directly upon the companies without all of the present paper work. If, as in this instance, the applications complied with the rules in the ratio of 330 to 1, the desired end would be accomplished. Critical materials would be conserved and only those entitled to receive service would get it. Otherwise the waste of time and manpower will continue.

Were it not for the perversive aspect of the situation it would be mindful of a quip popular at one of the San Francisco Bay shipyards. There it is said that not until the weight of the ship is equal to the weight of paper required to build it, is a hull launched.

Citation

MEDALS for heroes are numerous these days because heroes are numerous, too, in a world-scale war of a dozen fronts. Army and Navy "E" awards also seem to be numerous as the whole nation's factories throw themselves into war production. Such rewards are not given to non-military civilian services, even though their contributions do have an important bearing upon the total war effort.

In making a report to the electrical industry, which itself has been called into war service so completely, ELECTRICAL WEST finds ample reason for appreciation, if not for actual medals or awards, of the job the home front guardians, the utilities, are doing. The report in this issue bespeaks that appreciation on behalf of the industry, even as it describes to the industry the worth of that achievement in long-range terms.

Considering that most western utilities, during this war period, have likewise been fighting for their very own existences in SEC and FPC hearings, the fact that they have been able to render such unstinted home service to their customers and the industry is still more to their credit.

Such fighters deserve the respect and thanks of the industry they are fighting for in the battle for one of the first American freedoms—the freedom to do business.

How to Lose Friends

TOO much emphasis cannot be placed upon the element of courtesy in dealing with customers. Dealer or utility, wholesaler or manufacturer, the reasons are the same. Maybe there are no goods to be sold now, but times will change. The day will come when whoever has goods or services for sale will want friends. The war won't last for ever and once it has ended the opportunity to excuse every business shortcoming by saying "it's the war" will be gone. Surely the treatment being accorded customers in many instances today won't make or keep friends. Too many times customers are made to feel like a man buying a railroad ticket recently. He unctiously commended the clerk highly for his courteous and considerate attitude. And he concluded with the statement: "But the public won't stand for this kind of treatment one minute once the war is ended."

SEVERAL weeks ago I heard a distinguished economist say, "History will record America's industrial achievement as the oustanding miracle of the war." These are the accomplishments of the businessmen Washington asked, without regard for their political beliefs, to come down and pitch. Could you and I suggest more competent men than the present topside group in WPB? I think not. In the face of these facts, we must answer this question: Isn't it dangerous to allow our irritation over details to blind us to the over-all results? But just what are these things, about which we complain anyway? Material shortages? Of course. You can't reduce inventory turnover on a nationwide scale, and turn automobile plants into gun factories, and expect a continuous flow of materials in quantities without precedent. Red tape? Plenty. But many of our great corporations had years in which to achieve their smooth-working procedures. Incompetent personnel? Certainly. There are no examples in all business history where a hastily assembled force of inexperienced people was converted into a first-rate outfit in a few months. It seems to me that our job is to accept these irritating details as the inevitable incidents to the fastest, greatest industrial changeover in the world's history. If Nelson and his men fail, what group can succeed? If these representatives of business cannot produce, then all businessmen will be branded as failures in their fields. The course of action is clear to me. We need to quit bellyaching. We need only look at the production record for inspiration and confidence. We need to give these production heroes a pat on the back instead of a kick in the pants. They need our help. We certainly need theirs.
—Louis Ruthenburg, president, Servel, Inc.

NEWS of the industry

$11,500,000 ALLOCATED TO CENTRAL VALLEY PROJECT

Included in the Interior Department appropriation bill approved by the House appropriations committee was $11,500.000 for continuation during fiscal 1943-44 of work on the Central Valley project in California. Total funds allocated to the Bureau of Reclamation were $15,118,500.

The Central Valley Project funds are to permit installation of two 75,000-kw. units at Shasta Dam, to resume work on certain phases of Friant Dam and to complete a portion of the Madera canal. The committee recommended that no funds be expended for construction of transmission facilities between Shasta substation and Oroville. Testimony brought out the fact that consideration was being given to possible construction of this line employing silver conductors.

The Bonneville Power Administration was given no new funds, but was authorized to expend $3.200.000 of its unexpended appropriations for marketing, administration and operation costs. This was a reduction of $87,000 from budget estimates, the major part of which involves district offices. It was estimated that the administration will enjoy an unexpended balance of $30.000.000 at the end of June.

Attorneys File Briefs In Utility Rate Case

Briefs have been filed with the Utah Public Service Commission by attorneys for Utah Power & Light Co. and by PSC attorneys in the rate proceedings which have been before the commission since last December. Commission attorneys, basing their contention on an original cost valuation of the company, assert that a 25% reduction in rates is justifiable. The company brief points out that present rates are 27% below the national average and are in line with earnings based on present value.

In summarizing the record, the company brief says:

"This company is furnishing electric service to its customers at the lowest rates in its history and there is nothing in the record to suggest that they are in any way unreasonable or unfair or to suggest the necessity of further reduction. Further reductions may become possible and fair when future experience reveals a service demand and net revenues justify such reductions. In times so unsettled as the present it is quite impossible to say what new and unanticipated difficulties may confront the company, but if the company's bonded debt can be refunded upon favorable terms, savings in bond interest requirements may be looked upon as giving promise of substantial reductions. It should be remembered that the company is not asking for a rate increase, but that it is the commission's staff which wishes to disturb present revenues during abnormal and uncertain conditions."

Arizona Association Denies Jurisdiction of State Body

The Salt River Valley Water Users' Assn. has filed a brief denying the jurisdiction of the Arizona Corporation Commission over its electric rates. The action follows a legislative resolution asking the commission to assume jurisdiction.

The association's brief is based on the contention that it is a federal agency and as such is subject to federal regulation. While the association is a public service agency in some respects, the brief says, state regulatory authority is limited by constitutional principles. One such principle is "that a state may not legislate on subjects exclusively within the power of the United States or on subjects over which the United States exercises its superseding jurisdiction. The United States has assumed plenary power to control the rates at which power of the association is sold and is presently engaged in negotiations with the association on those rates. Thus although the Corporation Commission might have had jurisdiction over the association in the absence of action by the United States (which premise, however, is not admitted), it cannot now assume jurisdiction in the face of federal control in a sphere of recognized federal authority."

● OREGON's state supreme court has upheld the validity of the Northern Wasco county PUD in a decision of a suit which claimed that no PUD can be valid unless voters in every parcel of territory in the district approve of it. The PUD was formed in 1939 after an election in which voters in the towns of Dufur and Mosier turned down the proposition. The state hydroelectric commission declared the district created but at the same time excluded the two communities voting "no."

$164,780,282 BUDGETED FOR POWER EXPANSION IN WEST

Electric utility construction budgets for 1943 as reported to the Federal Power Commission by private and municipal utilities and federal power projects in the Mountain and Pacific states total $164,780,282. This compares with actual reported expenditures for 1942 of $162.229,700. For the U. S. as a whole 1943 budgets total $539,272.932 and 1942 expenditures were $755,321.997.

Budgeted expenditures by states for the region are as follows: Montana, $1,888,746; Idaho, $845.678; Wyoming, $272,799; Colorado, $2,136,873; New Mexico $526,781; Arizona, $6,100,403; Utah, $997,807; Nevada, $7,542.572; Washington, $41.666.183; Oregon, $6,591,746 and California, $76.210,694.

Major item in the budgeted 1943 expenditures is hydro generation with a total of $80,516.287. Other classifications include: steam generation, $13,512,860; internal combustion generation, $59,667; transmission, $26,695.207; distribution, $22,063,255 and general, $1.933.006.

FPC Allocates Fort Peck Dam Cost to Power Development

Entire cost of the initial power plant at the Fort Peck dam in Montana, estimated at $5,411,000 as of completion date about July 1, has been allocated to power development for rate-making purposes by the Federal Power Commission.

The commission pointed out that nothing in its determination shall be construed as a confirmation or approval on its part of any rate schedules, sales, contracts or proposed sales or contracts for power. Under terms of the act, that power not required for operation of the dam and navigation facilities is to be turned over to the Bureau of Reclamation for sale at rates sufficiently low to encourage widest possible use and sufficiently high to pay production and distribution costs and amortize the project's power costs.

It has not been possible, under wartime materials restrictions, to construct transmission lines necessary to market the power. For the duration, most of the 35,000-kw. installed capacity will be utilized for war production in Montana's industrial section, moved over existing lines erected for construction.

light is in the fight

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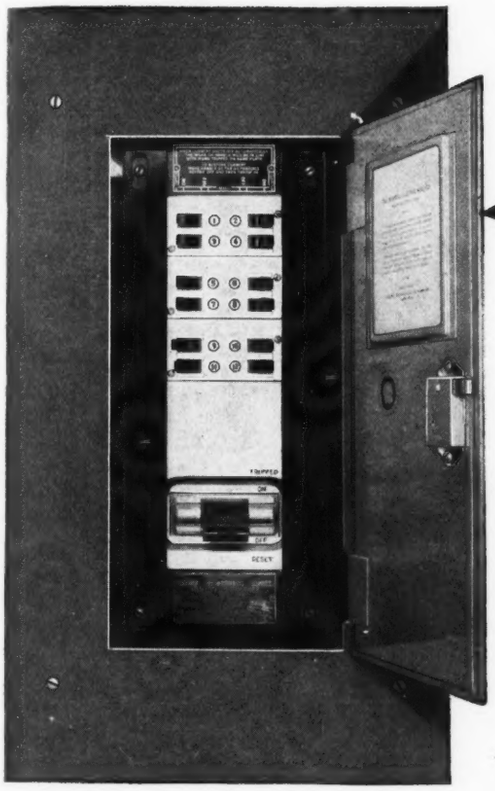


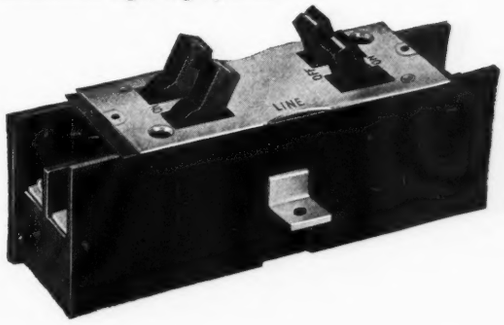
with TRUMBULL multi-breaker panels

Good lighting for the man at machine and desk is so necessary that distribution and control equipment is now a matter of first consideration by management.

Flexibility of the distributing means . . . provision for easy expansion of circuits, as conditions necessitate . . . simple, trouble-free control and positive protection are all requirements of modern lighting systems.

Trumbull Type NM1B Multi-Breaker lighting panels meet these conditions in every respect . . . at low cost . . . and with time-tested Circuit Breaker units which require no fuses, nothing to replace. Service, interrupted by overload, may be restored "at the flip of a switch". Moreover, use of critical materials is held to a minimum.

Note the valuable features which make Multi-Breaker the ideal panel for industrial lighting systems.



EASILY INSTALLED — NM1B Panels are assemblies of totally enclosed MB units containing accurately calibrated and sealed thermostatic protective elements. Electrically and mechanically adapted to quick installation, easy expansion.

COMPACT — Most suitable for use in restricted space . . . with special narrow Column Type Panels available for installation in the web of "H" columns.

LONG LIFE — Thermostatic bi-metal element, deflected by heat from overload, will operate thousands of times without damage to element. Does not, however, allow minor or momentary overload to interrupt service.

AVAILABLE —for alternating current as follows: Single Phase, 3 Wire, 115/230V. grounded neutral; Single Phase, 2 Wire, 115V.; and 3 Phase, 3 Wire, 115V. Can be supplied with either lugs or circuit breakers in the mains.

TRUMBULL

MULTI-BREAKER PANELS

Branch circuits are available in 15, 20, 25, 35 and 50 ampere capacities, single and double pole. Flush or surface mounting. Also available in column type for 10" "H" beams and 7¼", designed for 8" beams.

Illustrated and described in Trumbull Bulletin No. 309.

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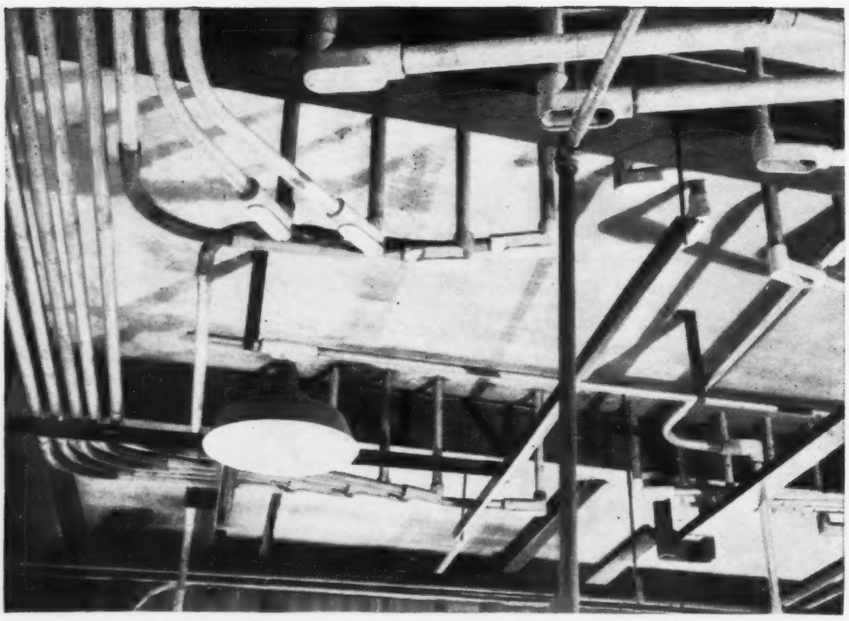

Use G-E Rigid Conduit

To Protect Wiring in Hazardous or Wet Locations

Two G-E rigid conduits are available to help guard against electrical breakdowns in war production plants. Both are high quality. G-E White is hot-dipped galvanized. G-E Black is coated with a corrosion-resistant enamel.

WPB Limitation Order L-225 permits the following uses for rigid conduit: (Type of protective coating is not restricted.)

1. In war implements such as warships, aircraft armament, tanks, etc.

2. In projects rated A-1-J or better for hazardous or wet locations (with conduit size limitations).

Use these protective conduits for maintenance work . . . for conversion wiring . . . for new war wiring. Also G-E electrical metallic tubing and G-E flexible metal conduit are available for use in certain locations in accordance with WPB Limitation Order L-225.

. . . . . .

For further information see the nearest G-E Merchandise Distributor or write to Section C632-18, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC

BONNEVILLE MOVES TO DISMISS PGE SUIT

A motion to dismiss the suit brought against Dr. Paul J. Raver, Bonneville Power Administrator, by the Portland General Electric Co., and a similar suit brought against Dr. Raver, PGE, its bondholders' committee and others by the independent trustees, has been made by Bonneville attorneys in the federal district court in Portland. The motion is based on the contention that Congress must give consent before a private power firm or its trustees can sue the Bonneville Power Administration.

Both suits seek to force BPA to enter into a long-term contract for power with PGE without including certain conditions relative to the sale of parts or all of the PGE property. In addition to its basic contention BPA alleges that the suit is invalid because the defendants have not been properly served, that the plaintiff failed to name the Secretary of the Interior as a defendant and that the plaintiffs failed to comply with federal rules of civil procedure in some instances.

Construction Expert Starts Investigation of Dam Costs

John Downing, construction engineer of the firm of Charles T. Main Co., of Boston, has arrived in Tacoma, Wash., to aid in the investigation of the mounting costs of the $17,000,000 second Nisqually power project. Utilities Commissioner R. D. O'Neil has presented a lengthy report to the council on the progress of the project, and Downing will examine figures presented by Chief Engineer J. V. Gongwer to determine the percentage of completion.

Meanwhile Commissioner O'Neil has asked for authority to issue $3,000,000 in special obligation bonds, the last of $11,000,000 agreed to by the city council to help finance the project. The $3,000,000 issue would be known as Series C. Series A and B, each covering $4,000,000, were authorized and issued in months past.

● RATE REDUCTIONS aggregating $2,110,000 annually have been approved by the Los Angeles Board of Water & Power Commissioners. The new schedules incorporate reductions of 4.1% in residential electric bills, 8.6% in commercial lighting and 6.4% in general power. A similar scale of reductions was voted prior to Pearl Harbor in 1941 but was held up by the Los Angeles City Council pending a clarification of wartime economic conditions.

New Fluorescent Luminaire

SPEEDS PRECISION WORK . . . REDUCES SPOILAGE

Where dimensions and tolerances are measured in *ten thousandths* of an inch, a mere shadow can mean the difference between the right specifications . . . and spoilage.

That's why glareless, shadowless illumination is so necessary for maximum war production of precision parts and assemblies. In fact, good lighting helps all production, whether in foundry, factory or office.

New Westinghouse Luminaires give this kind of lighting—the high-visibility, modern illumination you need, and they comply with Limitations Order L-78.

The moisture-resistant, nonmetallic reflector is covered with a multi-coat, polymerized finish which provides a reflection factor of 85% or more. And it requires only a "twist-of-the-wrist" to attach or remove this reflector, making it easy to keep clean and at top efficiency. The ballast, now externally mounted, provides power factor ranging from 92 to 99%.

These new Westinghouse Luminaires are available for 2 or 3 lamp, 40-watt and 100-watt, individual or continuous strip installations. Any one of 117 Westinghouse Electric Supply Company Offices and Independent Westinghouse Lighting Distributors will gladly give you full details regarding these luminaires and their installation. Or write Westinghouse Electric & Mfg. Co., Edgewater Park, Cleveland, Ohio, for booklet B-3265.

"Tune in the Westinghouse Program, Starring John Charles Thomas, Sundays, 2:30 P. M., E.W.T."

Westinghouse *Lighting Equipment*

Plants in 25 cities . . . Offices everywhere

Heats in Winter Cools in Summer

In Army-Navy camps and war plants these economical Thermador Fan-Type Electric Heaters are providing comfort and convenience.

With a flip of a switch, these double-purpose units heat in winter, circulate cooling air in summer. Flameless, fumeless Thermador Heaters are only available on priority orders in portable or built-in types for use on 115-volt A.C. service, 1650 watts capacity, or 230-volt A.C. in capacities up to 5000 watts.

When victory is won, you'll enjoy a Thermador in your home to heat cool corners, to cool warm areas, to dry clothes and hair—they're another reason to buy War Bonds today!

Thermador also manufactures built-in Electric Heaters, Electric Ranges, Electric Water Heaters, and Radio Transformers.

Write today for Catalog EW 6

THERMADOR
ELECTRICAL MFG. COMPANY
5119 South Riverside Drive
Los Angeles, Calif.
Seven Leagues Ahead

HETCH HETCHY POWER GOING TO NEW ALUMINUM PLANT

One pot line of the new Defense Plant Corp. aluminum plant at Riverbank, Calif., began receiving energy last month from San Francisco's Hetch Hetchy power system and two additional lines are scheduled for operation in October, bringing the ultimate load to 90,000 kw.

Service to the new plant was temporarily interrupted last month when a Navy training plane flew into the Hetch Hetchy San Joaquin River crossing, cutting one wire of both circuits and killing the pilot. The resultant interruption burned out four coils in one of the Macassin Creek generators. Service was restored in a matter of hours.

USBR Reports Progress On Central Valley Studies

Progress is being made on the 24 studies relating to the Central Valley project which are being conducted by the US Bureau of Reclamation. Preliminary reports have been drafted on four of the first five problems, all of which have a war relationship, according to George W. Howson, project study field coordinator.

The guayule rubber study has been suspended. However, the irrigation, power, industrial water and project schedule studies are being pushed. The power study, aimed at answering the question, "What war plants in or near the project could advantageously use project power, and in what amounts?" has been divided into four sections. An inventory of war plants shows 96 establishments with listing of 1942 power utilization and estimated future requirements. An inventory has been made of undeveloped mineral resources that might be rendered useful to the war if power were available. Future developments of industries for war purposes are covered in another section. The final section covers schedules of available power from Shasta and Keswick dams as originally planned and as now set up under priority regulations of the WPB, together with an estimate of the quickest possible schedule assuming all restrictions were removed.

● UNDER CONTRACTS effective May 1. Bonneville Administration is serving power to the Northern Idaho Rural Electrification Rehabilitation Assn. and the Pend Oreille Electric Coop. The former serves customers in Bonner and Boundary counties in Idaho and the latter in Pend Oreille and Spokane counties in Washington. Bonneville power will be routed over lines of Washington Water Power and Mountain States Power companies to serve the cooperatives. More than 100,000 kwh. per month will be used by approximately 1,350 customers of the two REA systems.

This dramatic picture shows the cross-over pipe from high pressure (left) to low pressure turbines of the 65,000-kw. turbo-generator at Los Angeles Bureau of Power & Light's Harbor plant, scheduled for operation in June

OVER 36 UTILITIES

are using the PM plan to spearhead service campaigns

Introduced a short time ago, Anaconda's Preventive Maintenance Plan is being widely used by utilities to help customers keep electrical systems operating *efficiently*—despite shortages in essential wiring equipment.

Already some 36 utilities are actively engaged in this program. With it, they are helping their industrial power customers maintain continuous wartime production by preventing electrical breakdowns.

1 WHAT THE PLAN IS

The PM plan is a simple but comprehensive way to safeguard war production by preventing electrical breakdowns *before they develop.*

2 HOW IT WORKS

The plan provides a practical means of making periodic, systematic analysis of circuits and equipment. Uncovers potential weaknesses . . . suggests ways to correct them . . . prevents overloading of lines.

Data thus gathered aids local W.P.B. Branches in reaching decisions on requests for materials to *prevent* breakdowns.

3 HOW UTILITIES BENEFIT

The PM plan helps utilities maintain close customer contact despite a lack of "something to sell." Offers basis for service campaign that definitely appeals to customers. Puts the utility in a leadership role for furthering war production throughout the area it serves.

If you aren't already utilizing the Anaconda Preventive Maintenance Plan, mail the coupon for full details. 43233

"Tomorrow may be too late . . . do it today!"

ANACONDA'S PREVENTIVE MAINTENANCE PLAN

ANACONDA

Anaconda Wire & Cable Company
25 Broadway, New York City

Please send copy of the Anaconda Preventive Maintenance Plan for safeguarding wartime production.

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Company .....

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6K

G-E DOES IT AGAIN!

Once again, after long experimenting, General Electric contributes to better, more economical and more satisfactory fluorescent lighting. The new FS-40 "Watch Dog" has everything. Here are its major features:

1. **Average life equivalent to the life of ten 40-watt lamps under specified test conditions.**
2. **Ends blinking and flickering by cutting out dead lamps.**
3. **Positive lock-out with all current off.**
4. **Long ballast life by eliminating current flow.**
5. **Instant lamp replacement because there's no cooling period.**
6. **Conserves vital war materials.**
7. **All of this means reduced costs to you.**

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Appliance & Merchandise Dept.
General Electric Co., Bridgeport, Conn.
Gentlemen: Please send additional information on your new FS-40 Starter to:

Name.....
Company.....
Address.....
City..... State.....

GENERAL ELECTRIC

UTILITY ADVERTISING TO DISCOURAGE POWER WASTE

Waste in war is a crime; don't waste electricity just because it isn't rationed. That slogan, or its equivalent, has been recommended by the leaders of the two national electric utility associations to all operating companies for inclusion in their advertising copy.

The action results from a suggestion by J. A. Krug, director of the WPB Office of War Utilities, that utilities eschew "promotional" advertising during the war. Wording of the slogan was worked out at a meeting arranged by President Tom P. Walker of the Council of Electric Operating Companies and attended, in addition, by C. W. Kellogg, president of Edison Electric Institute, Krug, and representatives of the industry and of OWU. In a letter to all companies telling of the meeting, Kellog said:

"The Office of War Utilities representatives felt that any advertising claiming adequacy of power supply had a promotional tendency; that during wartime the greatest effort should be made for conservation of all kinds, and that a recommendation to avoid waste should be encouraged by the utilities."

The letter suggests that the slogan or its equivalent be inserted as a block in regular advertising or worked into the text as individual companies may prefer.

Imperial Irrigation District May Buy Out Private Firm

Negotiations are proceeding between the Imperial Irrigation District and the California Electric Power Co. looking toward ultimate sale of the company's facilities in Imperial Valley to the district. The two organizations serve the area competitively at the present time.

The California legislature paved the way for such action with the passage of a bill defining the boundaries of the district for the purpose of holding an election to approve the proposed purchase of the property.

● JUDGMENT confirming the verdict of the jury which recently decided that $9,500,000 is just compensation for the Puget Sound Power & Light Co.'s distribution properties in Snohomish County, Wash., has been signed by U. S. District Judge John C. Bowen. The PUD or the power company can accept this verdict, or can appeal to the U. S. circuit court of appeals.

Whether an Underhung or Upright Switch Cole builds it

With experience in making both indoor and outdoor switches for all types of mountings—and for a wide range of voltages and amperages — Cole Electric can fill any of your switch requirements . . . The switch illustrated is one pole of an outdoor triple-pole, single-throw, 115/132-kv., 600-amp., underhung vertical air break disconnecting switch designed for group motor operation. Like all Cole switches it has the essential features which add life, insure good contact and make it easy to open or close . . . If you have a switch problem, let Cole Electric solve it.

Features of the Cole Type OD Switch

1. Blade balanced in any position.
2. Contact pressure applied or released prior to any blade movement.
3. Silver to silver contacts.
4. Main bearings, sealed frictionless type.
5. Secondary bearings, ground stainless steel pins and shafts in reamed Oilite

Cole Electric Company

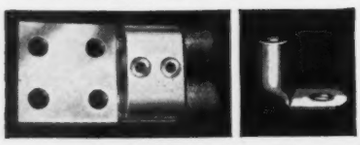
1510 SOUTH LOS ANGELES STREET, LOS ANGELES, CALIFORNIA

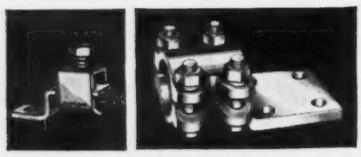
Western Representatives: CONDON & YOUNG, INC. • EICHER & BRATT
357 SOUTH HILL STREET, LOS ANGELES • COLMAN BLDG., SEATTLE, WASHINGTON

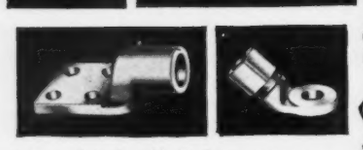
"To get the **RIGHT** lug at every point—

—select your terminals from the **COMPLETE** line"

Look in the Penn-Union Catalog —all of the good types: Solderless lugs to grip the conductor by Bolt, Screw, Post-and-Nut, or Multi-Slit Tapered Sleeve . . . Soldering lugs, Cast and Stamped, in wide variety . . . Here are just a few:







You will also find the most complete line of Cable Taps, Tee Connectors . . . Straight, Parallel, Elbow and Cross Connectors . . . Bus Supports, Clamps, Spacers . . . Grounding Clamps, Service Connectors.

F. M. NICHOLAS CO.
1123 Harrison St., San Francisco

KENNETH ANDERSON CO.
334 East 4th St., Los Angeles

NORTHWESTERN AGENCIES
2411 First Ave., Seattle, Washington

Penn-Union Electric Corp., Erie, Pa.

PENN-UNION
Conductor Fittings

UTAH POWER & LIGHT CO. COMPLETES LINE EXTENSION

Utah Power & Light Co. has completed a new $575,000 extension to its transmission network which will serve the east central Utah coal and mining region and at the same time furnish stand-by service to the new Columbia Steel Co. plant at Geneva.

Included in the project were 43 miles of new 132-kv. line and re-insulation of 70 miles of existing line from 44-kv. to 132-kv. The new "H" frame construction extends from a point east of Salt Lake City to five miles beyond the Geneva works where it connects with an older line extending 70 miles south to Helper. Most of the work of re-insulating the 70-mile section was done while the line was hot.

NLRB Hearings to Determine Bargaining Agency

NLRB hearings were held in Los Angeles last month on applications from the CIO Utility Workers' Organizing Committee to be designated as the collective bargaining agency for employees in the Southern California Edison Long Beach steam plant and from the AFL International Brotherhood of Electrical Workers to be similarly designated for physical employees in two separate districts.

The Edison company contended in the hearings that agreements covering collective bargaining should be on a systemwide basis rather than covering individual districts. Findings of the NLRB examiner will be submitted to Washington for final ruling.

● THREE ADDITIONAL NLRB ELECTIONS have been ordered for June in divisions of the Pacific Gas and Electric Co. Physical workers of the San Joaquin Power division will vote whether they wish to be represented by the International Brotherhood of Electrical Workers (AFL), the Utility Workers' Organizing Committee (CIO) or neither. Office and clerical workers in the Humboldt and Shasta divisions will vote whether they wish to be represented by the IBEW in collective bargaining.

● TACOMA, WASHINGTON Board of Contracts & Awards has given a contract to the Star Iron & Steel Works, of Tacoma, for furnishing eight radial gate hoists for the Alder and LaGrande dams of the second Nisqually power project. The company bid $74,160. The contract for supplying two 15-kv. oil circuit breakers was let to the Home Electric Co., of Tacoma, for $7,946.

With more than 5,000,000 cubic yards of concrete poured, Shasta Dam is about 80% complete. The high blocks in the left abutment section at upper right are within less than 20 feet of their ultimate height. The 15-foot penstocks in the foreground will carry water from the reservoir to drive the 103,000-hp. hydraulic turbines in the power plant. (USBR photo)

IF SO—YOU ARE EARNESTLY INVITED TO SEND FOR IT...NO CHARGE, NO OBLIGATION

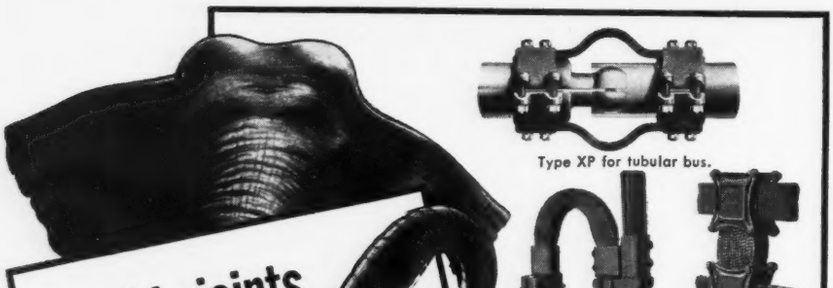
If you are responsible in any degree for the specification or purchase of high priority, heavy duty cooking equipment, you should have this book. Printed in three colors, on letter-size paper, and attractively bound, it contains 72 pages of photographs, data, specifications, and 8½ x 11" blueprints of heavy duty electric ranges, ovens and accessories.

To secure your free copy, simply make the request on your letterhead. It will be mailed to you at once.

ARMY E NAVY

ELECTROMASTER INC.

1807 E. ATWATER STREET • DETROIT


flexible joints
Type XP for tubular bus.
Special combined flat bar stud connector and flexible joint.
Flexible connector for parallel groups of laminated flat bars.
Type XFL, a simple and inexpensive expansion joint for flat bar.
Flexible copper braid.

Flexible electrical joints, employing flexible copper braid, have long been used. Yet, *until Burndy conducted extensive laboratory tests, little was actually known concerning the current carrying capacities of the different kinds and arrangements of copper braids.*

The knowledge thus gained is at your disposal when you call upon Burndy for the correct type of flexible joint; whether for 'moving' electrical parts of heavy machinery—to forestall damage from settling foundations—to absorb expansion, contraction, or shock—to ground movable switch handles—or for other similar purposes.

Patent No. 1,759,567

Headquarters for connectors

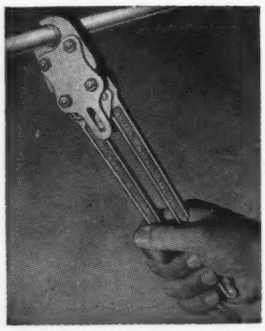
BURNDY *ELECTRICAL CONNECTORS ENGINEERED SPECIFICALLY FOR EACH NEED!*

OVERHEAD · UNDERGROUND · POWER · WIRING · GROUNDING

BURNDY ENGINEERING CO., INC. · 107 EASTERN BOULEVARD, NEW YORK CITY

HERE'S A WAY YOU CAN CONSERVE "CRITICAL" STEEL!

Briegel fittings are made with 25% *less* steel than any other fittings on the market. Approved specifically for use in concrete and interior jobs.



DISTRIBUTED BY

The M. B. Austin Co., Chicago, Ill.
Clayton Mark & Co., Evanston, Ill.
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General Electric Co., Bridgeport, Conn.
The Steelduct Co., Youngstown, Ohio
Enameled Metals, Pittsburgh, Pa.
National Enameling & Mfg. Co., Pittsburgh, Pa.
Triangle Conduit & Cable Co., New Brunswick, N. J.

BRIEGEL METHOD TOOL CO., Galva, Ill.

TECHNICAL DETAILS GIVEN ON BLASTING OF GERMAN DAMS

Technical details relating to the blasting of two storage dams in Germany by RAF heavy bombers on May 16 have been assembled by *Engineering News-Record*, supplementing the sketchy information contained in the daily press. Key structures in the Ruhr Valley storage and navigation systems, the dams were probably selected for destruction because of the resultant damage from released flood waters. British reconnaissance indicated that the floods seriously damaged or destroyed power houses, switchyards, bridges, railroads and industrial installations in both the Ruhr and Weser river valleys.

Details of the dams are reported in *Engineering News-Record* as follows:

"The Moehne Dam is a 132-ft. high 2,145-ft. long, gravity-type, stone-masonry structure arched in plan, with a base 113 ft. thick and a non-overflow crest 21 ft. thick. The spillway is in a side channel.

"From pictures made by the flyers the breach in Moehne Dam is more than 300 ft. long. The cut is immediately above the power house which is said to have been completely destroyed. The Moehne reservoir, of about 110,000 acre-ft. storage capacity, was an important part of the water supply of the Ruhr Valley. Built about 1912, it furnishes water for not less than 11 major hydroelectric installations, 300 water works and important industrial developments. Water supply in this area is so critical during the summer that this loss of storage might make the River Ruhr unnavigable, thus contributing further to overloading of the railway system in this important industrial area.

"Less is known of the damage to Eder Dam in the Weser River Valley. The dam creates a reservoir of 164,000 acre-ft., said to be the largest in Europe. Built between 1908 and 1914, the masonry structure is 157 ft. high with a crest width of 19 ft. and a length of 1,312 ft. Width at the base is about 120 ft. It is a non-overflow structure with flood discharge through openings in the dam.

"Storage is used to generate power at two plants at the dam and two other plants, one a pumped-storage, peak-load installation nearby. All may have been put out of service by the flood. Stored water also is used to make navigation possible along the Weser River during the summer months.

"A special dispatch to the *New York Times* states that RAF crews have been planning and practicing for the raid for months. Mines instead of bombs were used, the flyers coming down to

within 100 ft. of their objectives to drop the 1,500 lb. of explosives as near as possible to the point selected for attack.

"The crews who attacked the Moehne Dam said the first mine caused part of the top of the dam to break away and that another mine, striking squarely, caused further crumbling. Water pouring through the gap widened the opening.

"Returning crews said that they saw a breach 100 yd. long in the Moehne Dam and that a wall of water 30 ft. high washed down the valley. The same crews reported that they saw the power station swept away and the river spread itself over the lowlands.

"Reconnaissance photographs taken in daylight following the attack on Eder Dam showed the river in full flood and two uncontrollable openings in the dam.

"The dams are about 45 miles apart, on different watersheds, and separated by a hilly, wooded region. The Sorpe Dam on a Ruhr tributary also was attacked but information on the damage is not available. The Moehne and Sorpe dams controlled about 70 per cent of the flow in the Ruhr River."

● MEMBERS OF THE ELECTRIC CLUB of Washington, at a recent bond rally, voted to purchase $6.800,000 in War Bonds to build 19 Boeing bombers. The club's goal is 25 bombers, according to R. D. Horning, manager of the Seattle Electrical Contractors' Assn., and Louis Benedetti, president of the Industrial Electric Co., who proposed the plan. The Contractors association has posted a $100 bond, which will be given to the person submitting a winning name for the first bomber, provided he has purchased a $25 bond in the current drive. Subscriptions were made by individual members, electrical unions, electrical contractors and City Light.

● EXTENSIVE PORTIONS of the very human and complete annual report of the Montana Power Co. were lifted and made into a newspaper advertisement that aroused considerable favorable comment throughout the company's territory. The parts quoted were from the report of F. W. Bird, president and general manager.

● WASHINGTON WATER POWER CO. will purchase the Kemp & Hebert warehouse on Trent Ave. in Spokane, according to J. E. E. Royer, vice-president and general manager of the utility. The four-story structure, which the company has been leasing, is 50 by 138 feet and was built in 1928 at a reported cost of $102,000.

Putting 'em Thru the Mill!

Strip for Action! Strip made from WILBUR B. DRIVER CO. special alloys! Strip that has so many essential war uses! As it is rolled through their mills, day and night, we know it will do its part in flattening the Axis!

Consult us for your special alloy requirements in rod, wire, ribbon and strip—both hot and cold rolled.

ELECTRICAL SPECIALTY COMPANY

Pacific Coast Representative

LOS ANGELES 418 East 3rd St. | SAN FRANCISCO 316—11th St. | SEATTLE 562 First Ave., So.

Withstand heat, moisture, vibration and other adverse conditions. They cover a wide range of types, sizes, ratings, terminals, mountings and enclosures. Write for bulletins.

RESISTORS IN THE AIR

In the new Bendix RTA-1B two-way telephone for aircraft ground station service, WARD LEONARD, wire wound vitreous enamel resistors are used. They were selected because of their proven dependability under all conditions.

Ward Leonard Engineers are at the service of every manufacturer of equipment using resistors. They will gladly suggest the resistor from the Ward Leonard line that will not only give you the best possible service but will be best adapted for the conditions of assembly.

ARMY E NAVY ARMY E NAVY

WARD LEONARD

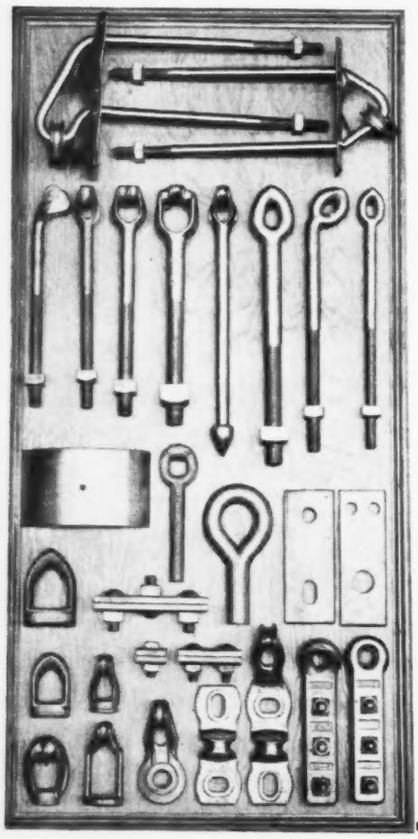
RELAYS • RESISTORS • RHEOSTATS

Electric control (WL) devices since 1892.

WARD LEONARD ELECTRIC COMPANY, 68 South St., Mount Vernon, N. Y.

VICTOR INSULATORS INC
V
VICTOR, NEW YORK
Distributed by MAYDWELL & HARTZELL, Incorporated
SAN FRANCISCO LOS ANGELES SEATTLE

KORTICK-CHANCE GUYING SPECIALTIES



Designed for quick, easy application, built to insure extra long life—"KORTICK CERTIFIED" guying specialties really meet Western requirements.

Kortick stubbing clamps also are available to help solve your wartime maintenance problems.

Call on Kortick for prompt deliveries.

Complete warehouse stocks at Los Angeles, Seattle, Honolulu, T.H.

KORTICK
MANUFACTURING CO.

OFFICE—PLANT—WAREHOUSE
345 First St., San Francisco
Telephone GArfield 8080

NORTHWEST UTILIZATION MEN SCHEDULE MEETING

A second conference on wartime problems of sales departments in utility companies will be held by the Utilization Section, Northwest Electric Light & Power Assn., at the Multnomah Hotel, Portland, June 11 and 12. The last conference of this character took place in November 1942. J. C. Plankinton, Northwestern Electric Co., Portland, is chairman.

New developments in the operation of sales and utilization departments will be discussed at round-tables. Personnel problems, dimout and brownout regulations in war production areas, dealer problems, customers' service, wartime advertising and postwar planning will be among the subjects assigned program time under discussion leaders.

San Francisco Utility Bill Lowest Among Major Cities

Among the 25 major U. S. cities the average customer in San Francisco pays least for electric, gas and telephone service, according to the annual report of the California State Railroad Commission. Los Angeles is fourth among the same group.

For comparable amounts of electricity, gas and two-party flat rate handset telephone service, a San Francisco customer pays $7.20 per month. In Louisville, Ky., and Houston, Tex., the same service costs $7.79 and in Los Angeles, $7.87. The costs are higher in all other major cities.

Washington Town Inaugurates Utility Occupation Tax

The City council of Bremerton, Wash. has passed an ordinance assessing a license or occupation tax of 2% on the gross business of selling or furnishing electric light and power by the Puget Sound Power & Light Co., or any other firm in a similar business in the city.

The ordinance makes the collection of the 2% tax retroactive from July 1, 1942, and the initial payment becomes due on July 1 of this year.

● ELLENSBURG, WASH. has completed sale of the last of the equipment in the auxiliary steam plant at the municipal light plant constructed 15 years ago at a cost of $50,000. Built as protection against the shutting down of hydroelectric plant by ice in the power ditch, the steam plant has been idle for years.

LET'S LOOK AT

COPPERWELD

[THICK COPPER EXTERIOR PERMANENTLY WELDED TO A TOUGH STEEL CORE]

COPPERWELD WIRE PROVIDES:

STRENGTH

—from the tough steel core. And the strength is permanent because the steel is protected from rust and corrosion by the thick copper exterior.

CONDUCTIVITY

The thick copper exterior (40% or 30%) provides electrical conductivity. The minimum thickness of copper is not less than 12½% of the wire radius for 40% conductivity and not less than 10% of the wire radius for 30% conductivity wire.

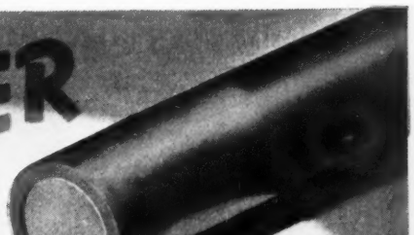
PERMANENCE

The copper and steel are permanently molten-welded. Copperweld has the rust-resisting life of solid copper.

COPPERWELD WIRE 30% COPPER (OR 40%)

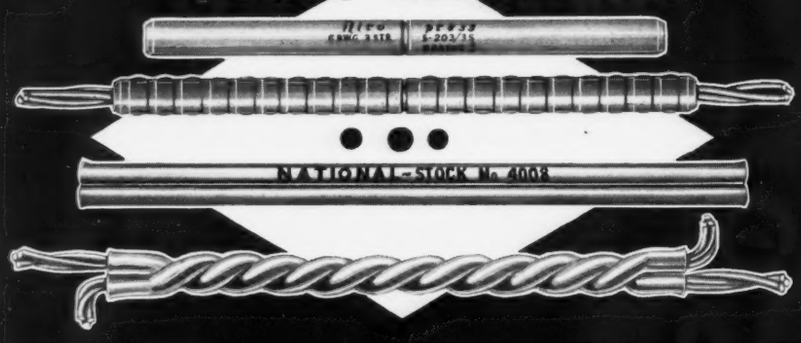
COPPER WIRE REQUIRES 100% COPPER

-and SAVES COPPER



COPPERWELD STEEL COMPANY • GLASSPORT, PA.

2 Ways to Splice 3-WIRE ALL STEEL POWER CONDUCTORS



1. BY THE *Nicopress* COMPRESSION METHOD

BWG Wire Size 3 STRAND	SLEEVE STOCK NO.	TOOL REQUIRED
8	5-165/3L	3-L
6	5-203/3S	3-S
4	5-238/3W	3-W

2. WITH TINNED COPPER GROOVED OVAL TWIST SLEEVES

BGW Wire Size 3 STRAND	SLEEVE STOCK NO.	SLEEVE LENGTH—IN.
8	4008	8¾
6	4006	11¾
4	4004	13

ALL OF THESE SLEEVES ARE FOR SPLICING 3-WIRE STEEL STRAND. FOR PRICES AND DETAILED INFORMATION CONTACT YOUR JOBBER OR WRITE DIRECT.

THE NATIONAL TELEPHONE SUPPLY CO.
5100 Superior Avenue, Cleveland, Ohio
Manufacturer of Specialties for Power and Communication Lines
Western Representative — J. E. Winchester, 1101 So. 4th Street, Alhambra, California
Canadian Manufacturer — N. Slater Company, Ltd., Hamilton, Ontario
Export Distributor — International Standard Electric Corporation, New York, New York

USE *Mailway Banking*

AT THE OFFICE AND AT HOME

There is no such thing as "banking hours" with a Mailway account. You can open one by mail (checking or savings) and conduct it entirely by mail — right from your home or office to suit your own convenience. Our special Mailway envelopes and passbook make this service fast and safe.

Open a Mailway account by mail

CROCKER FIRST NATIONAL BANK
OF SAN FRANCISCO
California's Oldest National Bank

Member Federal Deposit Insurance Corporation
ONE MONTGOMERY STREET

SMOOT-HOLMAN

SMOOT-HOLMAN COMPANY
SIGHT-CRAFT
INGLEWOOD CALIFORNIA

LUMINAIRES FLUORESCENTS
REFLECTORS FLOODLIGHTS

INDUSTRIAL AND COMMERCIAL LIGHTING EQUIPMENT

HOME OFFICE AND FACTORY
INGLEWOOD, CALIFORNIA

SAN FRANCISCO OFFICE & WAREHOUSE
460 7th Street, San Francisco, Calif.

REPRESENTATIVES
FRED ZAUGG, 907 N.W. Irving St., Portland, Ore.
COAST SALES CO., 307 Main Street, Seattle, Wash.
STEVENS SALES CO., 41 Post Office Place, Salt Lake City, Utah

BROWNOUT OF NON-ESSENTIAL LIGHTING EXPECTED SOON

WPB expects to institute a "brownout" of virtually all non-essential outdoor lighting about July 1, it has been learned from responsible war agency officials.

The move will have the endorsement of Fuel Czar Harold L. Ickes and Transportation Chief Joseph B. Eastman. The program will be instituted as a means of conserving coal, transportation, electric energy, light bulbs, critical materials, manpower, natural gas, oil and equipment.

The order is expected to be issued by WPB rather than by its component Office of War Utilities, although the latter will undoubtedly be responsible for its administration. Present plans call for the brownout to be nationwide without exception in application, although, as in all WPB orders, provision will be made for relief of demonstrable inequities.

As planned, the order will affect all advertising and outdoor commercial lighting. To realize what savings may be had in the residential field, WPB will sponsor a conservation campaign aimed at private users.

The order is not expected to restrict street lighting, which will remain in the hands of local and state governments. In order to realize those savings which are consistent with public health and safety, WPB is expected to ask these state and local governments to review their lighting programs with the idea of curtailing whatever lighting can safely be dispensed with. The order contemplates no compulsion in this matter.

It is expected also that night sports will be permitted as a means of maintaining home-front morale. Military plant protection and police lighting will be unaffected.

Daytime outdoor lighting of commercial business and industrial houses will be prohibited, and limited identification lighting will be allowed at night only during those hours in which establishments are open for business.

The exact standards of permissible nighttime business and commercial lighting were not disclosed, but it was understood that the coming program will be somewhat more restrictive than that proposed by the Office of Civilian Supply some weeks ago. Specific savings to be affected have not been made available.

War agency officials emphasized that the forthcoming brownout will be totally unlike the militarily-imposed dimouts, which have darkened the Pacific and Atlantic coasts, and resulted in noticeable increases in traffic acci-

The now useless chimney of this post office building at Grand Coulee Dam is being used as a conduit for the power line delivering electricity to the structure. Fact that the communities of Coulee Dam and Mason City are entirely heated by electricity has saved thousands of gallons of fuel oil, USBR officials say

dents. The WPB order, of course, will have no effect on automobile headlights. Thus, in the absence of any provision curtailing street lighting, the two principal factors in the increase of accidents in dimout areas will have been eliminated from the brownout.

Acquiescence of Ickes and Eastman in the proposal was predicated upon the realizable savings of many things rather than upon the savings of coal and/or transportation alone. The alarming shortage of light bulbs and the tungsten used in them may have been a factor in resolving the more or less aimless and politically-tinged bickering over the question which has been going on since the brownout was first discussed publicly last December.

● ADDING 70,000 kw. to capacity at Grand Coulee Dam, the second of two generators, originally constructed for Shasta Dam and diverted to Grand Coulee, was installed last month. The first 70,000-kw. machine went on the line in February. Rated capacity at the dam is now nearly one-half million kilowatts.

● OFFER OF the Federal Light and Traction Co. to sell the Tucson Gas, Electric Light & Power Co., to the city of Tucson for a firm price of $9,100,000 has been rejected by an advisory citizens' committee appointed by the mayor of the Arizona city.

Use More DROP FORGED Pole Line Hardware And Obtain

★

1 Plus Strength in Lighter Sectional Thicknesses.

2 Uniform Physical Structure, Size and Shape.

3 Freedom from Concealed Defects.

4 Extra Margin of Safety.

Forgings offer many direct and indirect economies. Consult makers of drop forged pole line hardware.

DROP FORGING ASSOCIATION

605 HANNA BUILDING • CLEVELAND, OHIO

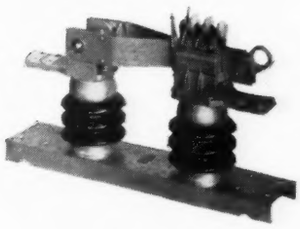
CY INC. CONDON & YOUNG, INC.

357 S. HILL STREET LOS ANGELES, CALIFORNIA

Representing

COLE ELECTRIC CO.

Disconnecting Switches

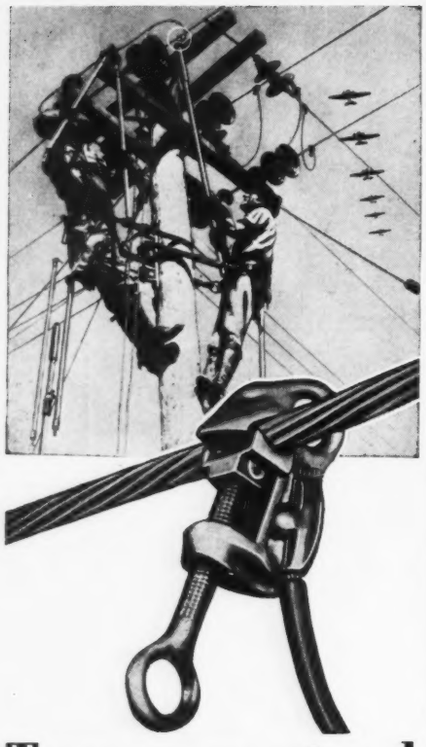


We also represent

UNITED STATES RUBBER COMPANY

Wire and Cable Division

LAPP INSULATOR CO., INC. BURNDY ENGINEERING CO., INC.



Tap new steel conductor extensions "hot" with TIPS G-P clamps

Tips G.P. (General Purpose) hot tap clamps are just the thing for use on line extensions authorized by W.P.B.'s Supplementary Utilities Order U-l-c. These zinc coated bronze clamps have been used for years to form a contact between dissimilar metals and have proven completely satisfactory in service on aluminum to copper, copper to steel or aluminum to steel connections. Tips G.P. clamps are of the same design as other types of Tips tap clamps having three point contact with the conductor tightened by means of the eye screw. A pressure screw makes a tight dependable contact for the jumper wire. They may be applied hot with Grip-All or other clamp sticks. Use them on all types of connections and avoid present or future service interruptions.

A·B·CHANCE CO. ABC INDUSTRIES CENTRALIA MISSOURI

PEOPLE
made this news

Frank Angle Promoted By Allis-Chalmers

Frank C. Angle, manager of the Allis-Chalmers San Francisco district office for the past seven years, has been appointed manager of the Pacific region and placed in charge of all Allis-Chalmers general machinery division sales activities serving industries in the Pacific Coast area, the company announced in Milwaukee June 1. The Allis-Chalmers territory now under Angle's supervision and direction includes California, Oregon. Washington, Nevada, Utah, Idaho and the western part of Montana and Wyoming.

While Angle will supervise Allis-Chalmers operations in the entire region, functions of the company's district offices will continue unchanged. Activities of the Los Angeles, San Francisco, Portland, Seattle and Salt Lake City offices will, however, be better coordinated to serve the needs of West Coast industries and other users of the electrical and mechanical equipment manufactured by Allis-Chalmers.

Angle came to the Coast in 1936 from Chicago, where he had represented Allis-Chalmers for seven years. He is a graduate of Oregon State College, having majored in mechanical engineering. He is a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the Engineers club of San Francisco, and newly-elected president of the Pacific Coast Electrical Assn.

Thomas Martin, Vancouver City Electrician, Retires

Thomas Martin retired as Vancouver, B. C. city electrician on May 15, following 30 years of service. The city council appointed L. H. Miller, chief inspector in the civic electrical department for the past 18 years, to fill the vacancy as acting city electrician.

Following service with the Vancouver electrical firm of Cope and Sons, Martin joined the city pay roll in 1913, going to work on ornamental street lighting. For 16 years he continued as a journeyman, then was appointed superintendent. For the past eight years he has been chief.

Martin's hobby is illumination. In

ANGLE

1921 he received a diploma from the Chicago College of Electrical Engineering; in 1922 he received a diploma as radio engineer and four times won diplomas in illumination in examinations conducted by Canadian Westinghouse. During his term of service, city street lighting was increased from 450 to 6,279 standards.

Among improvements carried out under Martin's direction is a new system of "suspension" type lighting increasing light on the street surface from 45% with the old system to 85%; traffic signals in the downtown area; an improved police radio system.

● A. E. HITCHNER, Westinghouse Electric & Mfg. Co., formerly Los Angeles manager, now in Pittsburgh, writes that when he met C. W. LEIHY, former engineering editor, ELECTRICAL WEST, now a lieutenant-colonel, Washington, D. C., and JAMES DAVENPORT, also a lieutenant-colonel, formerly Southern California Edison Co., and J. D. ENEFER, formerly of the Edison company, they had dinner and "we called it a PCEA convention."

● ERIC A. JOHNSTON, president of Columbia Electric & Mfg. Co. of Spokane, was re-elected president of the United States Chamber of Commerce recently. He was named to head the national group last year following a term as vice-president.

● E. O. "BILL" SHREVE, vice-president of General Electric Co., has been elected a director of the United States Chamber of Commerce.

● CARL DEVINE, formerly Southern California Edison Co., Alhambra, is now post engineer, electrical department, Fort Huachuca, Ariz.

Conduction-dipped wood pins can see you through the steel shortage

TODAY'S radically changing power demands have made it desirable for many companies to re-build or re-locate distribution lines. For such work, the conductor may be salvaged and the problem of scarcity then shifts to other materials...Among the most scarce are steel insulator pins. Their lack of availability has stopped work on many necessary lines... Here is a workable substitute for steel pins: a common wood pin dipped in O-B Conduction Paint. Tests have been conducted to prove that this arrangement possesses all the necessary electrical characteristics of steel and will remain serviceable for five or ten years, when permanent replacements can be made...Don't misunderstand us, we're not promoting wood in preference to steel pins as a permanent policy. We are merely offering a practical means for getting through the present emergency if steel cannot be obtained... Laboratory work on which these suggestions are based was done by O-B and, naturally, with O-B pintype insulators. It covers the range of voltages up to 69 Kv. With O-B insulators, we know the plan is thoroughly workable. With them, you may have the same assurance of satisfactory results.

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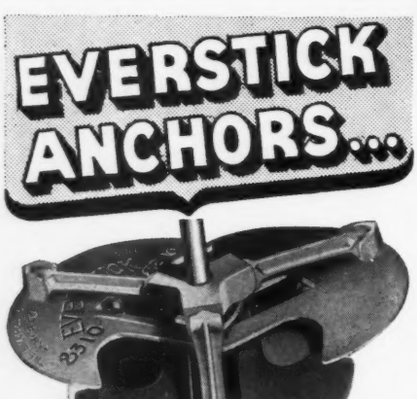

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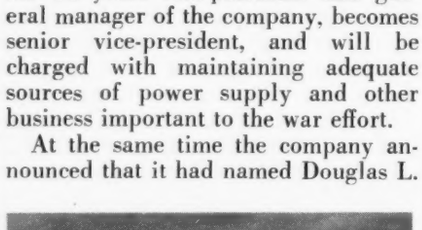
California Electric Power Co. Names Cage General Manager

Appointment of Albert G. Cage as general manager to suceed F. O. Dolson was announced by California Electric Power Co. last month. Dolson, for 14 years vice-president and general manager of the company, becomes senior vice-president, and will be charged with maintaining adequate sources of power supply and other business important to the war effort.

At the same time the company announced that it had named Douglas L.



CAGE

King general attorney, to act under supervision of the company's general counsel, Henry W. Coil.

Cage joined the company in 1914 as clerk in the engineering department. The following month, he was transferred to the commercial department and three years later became the first student in the company's student course. Following service in the first World War, he returned to the company for a time, then left to take a job with the California State Railroad Commission. Rejoining the company in 1922, he was made manager of the rate department in January 1932 and assistant general manager the following December. In 1935 he was named vice-president.

● Capt. Norman M. Andreason, formerly with Telluride Power Co., Richfield, Utah, is officer in charge of inspection of accident prevention at Fort Mason, Calif.

● R. B. Siegfried, former employee of Puget Sound Power & Light Co. at Bremerton, is at Fort Monmouth, N. J.

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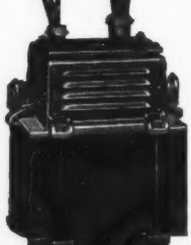

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Specify scattered transformers to eliminate duplicate conduit runs and save on power costs.

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Baldwin Locomotive Works Advances Holcomb

W. Horace Holcomb, former vice-president and general manager of the Pelton Water Wheel Co., San Francisco, and who a year ago was appointed assistant to the executive vice-president of the Baldwin Locomotive Works, Eddystone, Penn., recently has been appointed assistant to the newly-elected president, Ralph Kelly.

Kelly takes the presidency vacated by Charles E. Brinley, who becomes chairman of the board of directors of Baldwin Locomotive Works.

Kelly also will serve as president and Holcomb will serve as vice-president of the Pelton Water Wheel Co. in San Francisco.

Flagg Succeeds Bean as Oregon Utilities Commissioner

George H. Flagg, chief deputy secretary of state of Oregon, has been appointed state public utilities commissioner by Earl Snell, Oregon's new governer. He assumed office June 1.

Flagg succeeds Ormond R. Bean who was appointed to the position four years ago by Governor Charles A. Sprague.

Flagg has held the position of deputy secretary of state since 1934. In that position he served under Governor Snell, who was secretary of state prior to being elected governor.

● VERNE HANSEN has been named chief of the Utility Inventory Control district office at Portland, with offices in the Bedell Building. The district includes Oregon, Idaho and Washington. HAROLD L. VAUGHN, 617 Kittridge Bldg., Denver, is chief of the district comprising Colorado, Montana, New Mexico, Utah and Wyoming. W. J. MCCULLOUGH, 1031 S. Broadway, Los Angeles, heads the Los Angeles district office, with jurisdiction over California, Nevada and Arizona.

● JOHN M. NEWTON, president of Oakes Electrical Supply Co. of Holyoke, Mass., was awarded the James H. McGraw Award and wholesalers medal for 1942 at the May 26 meeting of the National Electrical Wholesalers Assn. in Buffalo, N. Y. The citation commended him for his perseverance in securing recognition of the electrical wholesalers as contributing to national defense and the war effort.

● FRANK W. GAIENNIE, manager of the Sierra Pacific Power Co.'s Truckee-Lake Tahoe district, recently was elected president of the Truckee Chamber of Commerce.

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● CHARLES E. HESS, utilization manager of the Puget Sound Power & Light Co. in Seattle, represented his firm at the conference of utility executives held in Chicago recently. Hess is credited with his company's present effective program of assisting homes and industry in the proper application of electricity to war effort, nutrition work, assistance to farmers and homemakers in the conservation of electrical appliances on hand. Postwar planning for the maximum benefits from electrical service was given major attention at the meeting.

● CLAUDE E. BIRD, former supervisor of the customer service department in Utah Power & Light Co.'s Salt Lake division, has been made assistant training director for job relationship training under the Training Within Industry program of the WMPC.

● BAILEY G. DINKELSPIEL, manufacturer's agent in San Francisco, died as a result of an automobile accident April 23. He handled the Mitchell Mfg. Co., Samson United Co., Steem Electric Corp. and Miracle Products, Inc. lines.

SOLVE VOLTAGE "HEADACHES" *with Custom-Built Transformers*

Installed in a large San Francisco Bay Area oil refinery are these 13 Gardner Transformers, ranging in size from 200 KVA 2300 to 230/460 Volts, to 10 KVA 2300 to 230/115 Volts.

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Answer to "Who Am I?"

S. J. Lisberger

(See Page 109)

Electriquiz Answers

1. The "demand" charge is measured in terms of power. Power is defined as "capacity for doing work."

2. Power may be measured in (a) horsepower (c) watts and (f) kilowatts. These units are related as follows: one horsepower equals 746 watts or .746 kilowatts.

3. Energy may be measured in (c) foot-pounds or (d) kilowatt-hours. These units are related as follows: one kilowatt-hour equals 2,654,155 ft.-lb., which means that at 100% efficiency one kilowatt-hour of electric energy could lift a weight of 2,654,155 lb. a distance of one foot.

4. The motors would use the same amount of energy because the work done would be the same in each case.

5. A larger motor would be required when there is insufficient time available for the smaller one to do the necessary work.

● ROBERT S. CLUBLEY is a new industrial lighting engineer on the staff of the General Electric Lamp Department, Los Angeles. His experience includes 17 years at the company's headquarters in Cleveland. He was recently dismissed from the Army Air Corps because of the "over 38" ruling. He served in the Air Service Command at San Antonio, Tex., and at Kelly Field as electrical specialist on aircraft equipment.

Charles S. Knowles, Pacific Power & Light Veteran, Dies

Charles S. Knowles, construction superintendent of Pacific Power & Light Co. and long-time veteran of the electric power industry, died April 24 in St. Charles Hospital, Bend, Ore., of heart complications resulting from pneumonia. He had been stricken four days previously while directing construction of power facilities to serve Camp Abbot, new engineers' replacement training center. The 16-mile line to the camp, built under severe winter conditions, was cut in the day following Mr. Knowles' death.

Funeral services were held at Kennewick, Wash., his home. Surviving are the widow and one son.

Mr. Knowles, who would have been 66 on April 30, had spent 48 years in the electric power industry, the last 32 as construction superintendent for Pacific, which he joined Jan. 1, 1911, shortly after the company's formation. He was responsible for a major share of the development of the company's system from a group of isolated and independent power systems to the present widespread and highly integrated system which supplies electric service in 22 counties of Oregon and Washington, chiefly along the Columbia River.

Born at Westerlo, N. Y., April 30, 1877, in 1895 he started as a student in the mechanical and electrical department of General Electric Co. at Schenectady, N. Y. His father had been one of the early men of G-E. Later Mr. Knowles became successively foreman in the switchboard and transformer testing departments of G-E at Pittsfield, Mass. After 15 years with this organization, he came to the newly-organized Pacific company as construction foreman. In later years he held in addition the post of general storekeeper. He was a member of the Masons, the Elks and Kiwanis Club.

● ALBERT H. KREUL, assistant superintendent of electrical maintenance and repair for Portland General Electric Co., died in that city May 5 after a long illness. He had been with Portland General Electric for 33 years in the engineering and operating departments. He was born in 1884 and took his electrical engineering degree at Iowa State College. He also studied law at the Northwest College of Law in Portland prior to joining the company in September 1910.

He was a member of the AIEE and Northwest Electric Light & Power Assn. In the latter he headed the meters committee for many years.

Use "X-Ray" Reflectors and conserve critical materials for war purposes. A minimum amount of metal is required in the holder and socket. The reflector itself is made of crystal glass.

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INDUSTRIAL LIGHTING UNIT

There's no need to resort to makeshift substitutes in order to conserve metal for war materials. The 500-watt "X-Ray" Silver Mirror Glass Reflector illustrated above is one of the most efficient and satisfactory lighting units ever designed, yet the complete unit, Catalog No. 588, uses only 9 oz. of ferrous metal.

"X-Ray" Silver Mirror Reflectors for industrial lighting are available in various sizes and types for incandescent lamps, up to 1500-watts, and also for the 400-watt Mercury lamp. Long life, low maintenance cost and ease of installation make them the natural choice for relighting industrial plants where lighting must be stepped up to meet wartime production standards. Write today for full information on "X-Ray" Reflectors.

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COMPLY WITH GOVERNMENT REGULATIONS
Government Departments or Agencies which have issued orders, specifications, or recommendations to discontinue the use of solder type joints, are listed below:
● Critical Construction Materials Design Guide, Feb. 19, 1943, page 23 Section E.
● War Dept., Office of the Chief of Engineers, Section XXXIV, Oct. 20, 1942, page 34-02.
● W.P.B., War Housing Manual, Dec. 12, 1942, page 31, article 370.
● Army and Navy Munitions Board, Bulletin Jan. 1, 1943, To Supply Services, Etc., page 19, article 5.
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Wire-Nuts
Solderless Tapeless Wire Connectors
MEET ALL GOVERNMENT REQUIREMENTS
By discontinuing the use of wire joints which require either Solder, Copper or Copper Alloys you help conserve critical metals and comply with Government Agency Regulations.

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The color tells the size

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W. E. Young Co., 1944 Broadway, Denver
H. H. Van Luven, 307 E. 3rd St., Los Angeles
Albert S. Knight, 3606 Western Ave., Seattle
Pacific Industrial Products Co.
9th & Harrison Sts., Oakland, California

TRICO FUSE MFG. CO., Milwaukee, Wis.

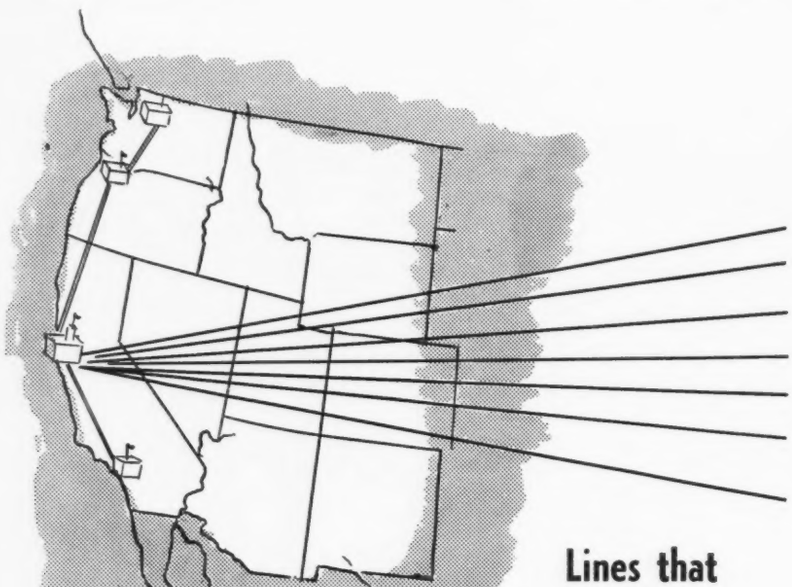
Death Takes Allan C. Balch, West Coast Electrical Pioneer

Allan C. Balch, 79, Southern California electrical pioneer, died April 30 in Los Angeles after a three-month illness.

Mr. Balch engaged in electrical activities in Seattle and Portland before going to Los Angeles in 1896 to join in the organization of the San Gabriel Electric Co., which later became the Pacific Light and Power Co. He was general manager of P. L. & P. and directed the developments the company made in the Big Creek and Kern River areas, at the Redondo steam plant and others.

In 1905 Mr. Balch was one of the five organizers of the company which later became the San Joaquin Light and Power Corp. In 1909 he was active in the formation of the Midland Counties Public Service Corp. Four years later he joined the Southern California Gas Co., of which he was vice-president at the time of his death.

For many years Mr. Balch had been prominent in educational, philanthropic and cultural circles in Southern California.



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Peter Clark Gill Dies at Vancouver, B. C.

Peter Clark Gill, electrical transmission and distribution superintendent for the B. C. Electric Railway Co., Vancouver, B. C., died recently after long service with the company. Born in Prescott, Ontario, Mr. Gill went to B. C. as a child, was educated in Victoria, and was graduated from McGill University in electrical engineering.

He joined the B. C. Electric in 1910 as assistant in the electrical department at the Vancouver office. In 1914 he became distribution engineer, receiving his appointment as superintendent in charge of construction and maintenance of all overhead and underground power circuits throughout the company's lower mainland system in 1921. He was a member of the University Club, Professional Engineers, and American Institute of Electrical Engineers.

TRADE *notes*

● H. F. HARTZELL, president of Maydwell & Hartzell, Inc., has announced the transfer of the company's northwest office and warehouse from Portland to Seattle. The Seattle address is 1016 First Ave. S.

Fred Mulvany, general sales manager of Maydwell & Hartzell, San Francisco, recently made an extended trip through the northwest territory with R. G. Harris, northwest manager.

● PURCHASE of the business of Reston Electric Co., Vancouver, B. C., ends one of the pioneer companies in electrical contracting. It was established by J. C. Reston, organizer of the contractors association in Vancouver, who has retired. The Jarvis Electric Co., headed now by A. E. Palmer and William Beck, was the purchaser and will move to the premises formerly occupied by Reston Electric at 524 Hornby St., Vancouver.

● DIEHL ELECTRIC SUPPLY CO. is a new wholesaling organization established June 1 at 45 Main St., San Francisco, by Pete Diehl. Principal business will be in marine electric supplies. Prior to setting up the new business Diehl was northern California representative for Russell & Stoll. Previously he had been for many years a member of the Pacific Coast sales organization of Phelps-Dodge Copper Products Corp.

General Electric Co. Opens Electronic Schools on Coast

Opening by General Electric Co. of a series of electronic schools on the West Coast was announced recently by W. M. Boland, of the company's electronics department. The schools, first of which has been opened in Los Angeles, with 35 enrolled, are designed to give G-E employees a thorough training in the fundamentals of electronics as applied to the requirements of the apparatus and industrial departments, as well as to those of the supply corporation.

P. E. Caldwell (right) G-E electronic engineer is in charge of the classes. He is assisted by E. S. Dibble (left)

Employees who sign up for the course are given 10 lessons of one hour and 15 minutes each. Sessions are held on Saturday mornings and are conducted by P. G. Caldwell, electronic engineer of the company's Pacific district.

Following the Los Angeles school, sessions are scheduled to begin at San Francisco in September. Similar schools will be held at a later date in the Northwest and Rocky Mountain districts, Boland stated.

● Railway and Industrial Engineering Co., Greensburg, Pa., manufacturer of "hi-pressure" contact switching equipment, announces the appointment of Garland-Affolter Engineering Corp. as sales representatives on the Pacific Coast. Offices for the sale of R&IE equipment will be maintained in San Francisco, Los Angeles, Portland and Seattle.

● Westinghouse has launched an educational program throughout the Pacific Coast district to train women to assist with the duties of junior application engineers, both in the manufacturing and supply companies.

● Beginning May 1, the name of the manufacturing division of the Spokane Radio Co. will be Pacific Electronics. The jobbing and wholesale division of the company will continue under the name of Spokane Radio Co.

The change was made coincident with the beginning of the firm's sixteenth year in business.

When anouncing the new name, Morris Willis, president and general manager, also announced that A. C. Nash of Chicago has joined the staff to be in charge of war contracts service for the company.

Directory Correction

● Electric Agencies, Inc. represents Overbagh & Ayers Mfg. Co. in San Francisco. The name of this representative was omitted from Electrical West's recent Directory Issue.

Moves

Paragon Electric Co., San Francisco, has moved from 84 Page St. to 2501 Harrison St.

N. C. Nicklassen, San Francisco contractor, recently moved from 5-A Downer St. to 1750 Eighth Ave.

W. R. Grasle Co., electrical contractors, Portland, moved from the Lumberman's Bldg. to 437 N.W. 16th St.

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NOW—lower prices and higher capacities

There is a Tork Clock for every regular switching job; 60 minute, 4 hour or daily cycles.

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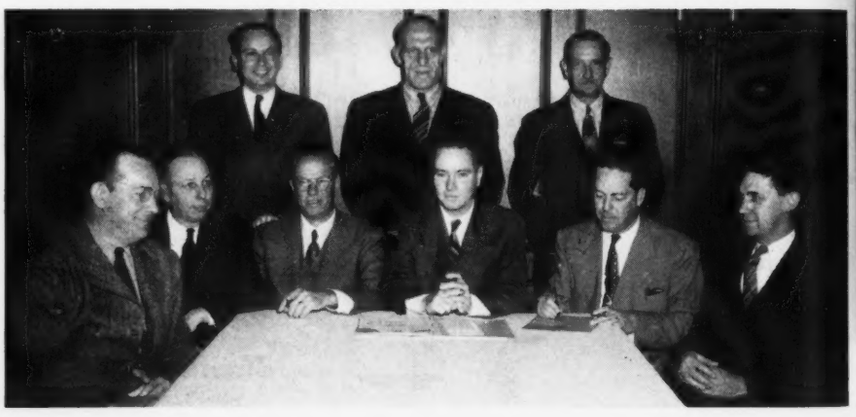
PROFILES *of the month*

Right: Peter Soo Hoo, in charge of arrangements for Mme. Chiang Kai-shek's Los Angeles visit, and A. W. Elliott, display manager for the Bureau of Power & Light, inspect the electric range and refrigerator which were installed in Madame's hotel suite there

Below: New officers of the San Diego Electric Club, left to right, back: Bruce B. Gravitt, Marvin E. Musgrave, Harvey K. Watt, directors; front: Oscar G. Thompson, director, George R. Gray, second vice-president; William W. Powell, first vice-president; President Hiram G. Dillin; Lyle Jones, secretary-treasurer; Jas. B. Lyon, director



Raymond M. Alvord, (left below) commercial vice-president of General Electric Co. at San Francisco, presents to George Greaves, chief engineer of radio station KPO, the 1942 G-E Merit Award for the station's excellent operation record

—Like the HUBBARD AUTOGAP Lightning Arrester "Shoots Out" a follow-up arc

In Texas and other oil districts, when a well takes fire, a famous firm of oil field fire fighters is called in to extinguish the blaze. This is often accomplished by "shooting out" the blast after wreckage has been cleared and the fire confined to the smallest possible area, usually the jet emitted from the top of the casing. "Shooting out" consists of placing at the casing, a heavy charge of gelatinous nitroglycerine which, when exploded, destroys contact between the gases and the flames so that the continuous feed of combustible material to the point of ignition is interrupted. There is much more to the trick, but in principle, that is the process.

Hubbard *Autogap* Lightning Arresters employ exactly the same principle, but the "fire" in this case, is electrical, and the dissipating force is supplied automatically by the passage of the current through the arrester. When the current is forced around core "A" and through the minute clearances "B" to reach ground, the confinement and the contact with the fiber surfaces causes an explosion. The gases generated are exhausted simultaneously in opposite directions through vents. The follow-up arc is "shot out" just as the nitroglycerine explosion snuffs out a burning oil well.

For detailed data and diagrams write for an illustrated "Autogap" bulletin containing operating data, installation methods, results of tests and other pertinent information.

HUBBARD AND COMPANY

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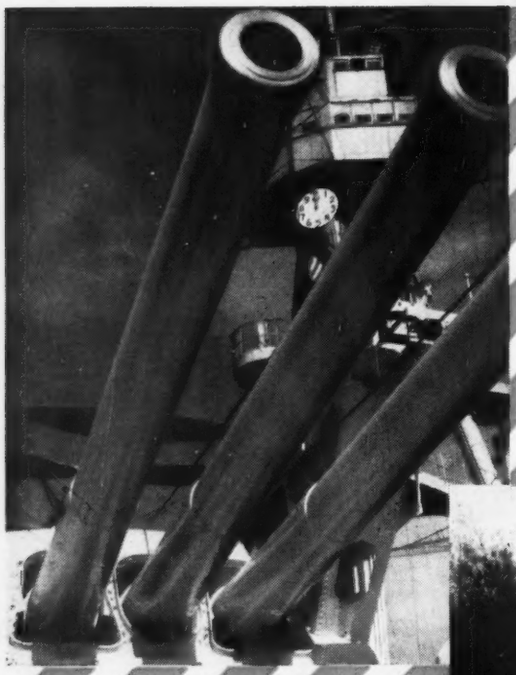

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IN A GUN TURRET *and*

IN A MODERN HOME

Adequate Wiring is Important!

In elevating, pointing, training the guns . . . in range-finding, timing, checking the shots . . . in the handling of ammunition, emergency controls and almost every other operation in the modern gun turret—electricity plays a vital part.

In the home of tomorrow, electricity has an equally big job. It will do more of our housework than we ever imagined possible. It will have important new duties safeguarding health and sanitation. It will provide undreamed of comforts and entertainment which should go a long way toward making home the center of family life as it used to be.

In all this, of course, **adequate wiring** is the key, and our job is to see that people don't forget it. A little persistent plugging during these times of restricted building and we'll have less trouble getting into high gear once the war is over and priorities are lifted.

Talk up adequate wiring among **your** friends, today and every day!

PACIFIC COAST ELECTRICAL ASSOCIATION

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